

Rosemount™ DP Level Transmitters and 1199 Diaphragm Seal Systems



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Rosemount™ DP Level Transmitters and 1199 Diaphragm Seal Systems

NOTICE

Read this manual before working with the product. For personal and system safety, and for optimum product performance, make sure the contents are fully understood before installing, using, or maintaining this product.

For technical assistance, contacts are listed below:

Customer Central

Technical support, quoting, and order-related questions

United States — 1-800-999-9307 (7:00 am to 7:00 pm CST)

Asia Pacific — 65 777 8211

Europe/Middle East/Africa — 49 (8153) 9390

North American Response Center

Equipment service needs

1-800-654-7768 (24 hours—includes Canada)

Outside of these areas, contact your local Emerson™ representative.

⚠ WARNING

Failure to follow these installation guidelines could result in death or serious injury.

- Make sure only qualified personnel perform the installation.

Explosions could result in death or serious injury.

- Do not remove the transmitter cover in explosive atmospheres when the circuit is live.
- Before connecting a communicator in an explosive atmosphere, make sure the instruments in the loop are installed in accordance with intrinsically safe or non-incendive field wiring practices.
- Both transmitter covers must be fully engaged to meet explosion-proof requirements.
- Verify the operating atmosphere of the transmitter is consistent with the appropriate hazardous locations certifications.

Electrical shock could cause death or serious injury.

- If the sensor is installed in a high-voltage environment and a fault or installation error occurs, high voltage may be present on the transmitter leads and terminals.
- Use extreme caution when making contact with the leads and terminals.

Process leaks could result in death or serious injury.

- Install and tighten all four flange bolts before applying pressure.
- Do not attempt to loosen or remove flange bolts while the transmitter is in service.
- Replacement equipment or spare parts not approved by Emerson for use as spare parts could reduce the pressure retaining capabilities of the transmitter and may render the instrument dangerous.
- Use only bolts supplied or sold by Emerson as spare parts.

Improper assembly of manifolds to traditional flange can damage sensor module.

- For safe assembly of manifold to traditional flange, bolts must break back plane of flange web (i.e., bolt hole) but must not contact module housing.

Sensor module and electronics housing must have equivalent approval labeling in order to maintain hazardous location approvals.

- When upgrading, verify sensor module and electronics housing certifications are equivalent. Differences in temperature class ratings may exist, in which case the complete assembly takes the lowest of the individual component temperature classes (for example, a T4/T5 rated electronics housing assembled to a T4 rated sensor module is a T4 rated transmitter.)

⚠ CAUTION

The products described in this document are NOT designed for nuclear-qualified applications. Using non-nuclear qualified products in applications that require nuclear-qualified hardware or products may cause inaccurate readings.

For information on Rosemount nuclear-qualified products, contact your local Emerson Sales Representative.

Individuals who handle products exposed to a hazardous substance can avoid injury if they are informed of and understand the hazard. If the product being returned was exposed to a hazardous substance as defined by OSHA, a copy of the required Material Safety Data Sheet (MSDS) for each hazardous substance identified must be included with the returned goods.

Section 1 Introduction

1.1 Using this manual

This manual is designed to assist in installing, operating, and maintaining the Rosemount™ 1199 Diaphragm Seal Systems for Pressure Transmitters and diaphragm seal systems that are part of Rosemount DP Level Transmitters including the Rosemount 3051SAL, Rosemount 3051L and Rosemount 2051L. The manual contains information about the seal system assemblies that are not covered in the corresponding transmitter manuals. For information regarding transmitter configuration, operation, and maintenance, reference the appropriate transmitter manual.

The information is organized into the following categories:

- [Section 2: Understanding Remote Seal Systems](#) provides an overview of Remote Seal Systems.
- [Section 3: Installation](#) contains mechanical and electrical installation instructions.
- [Section 4: Configuration](#) outlines how to range a DP Level Remote Seal System.
- [Section 5: Fill Fluids Specifications](#) describes the offering of fill fluids available with Remote Seal Systems.
- [Section 6: Maintenance and Troubleshooting](#) provides techniques for cleaning and maintaining the system as well as addressing the most common operating problems.
- [Appendix A: Specifications and Reference Data](#) provides performance, functional, and physical specifications, as well as dimensional drawings, and ordering information.
- [Appendix B: Product Certifications](#) contains intrinsic safety approval information, European ATEX directive information.

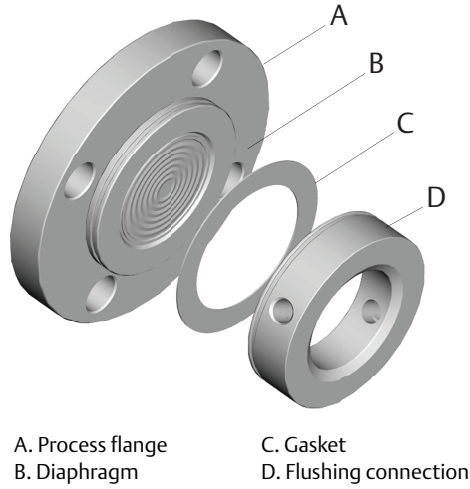
See Rosemount DP Level Transmitters and 1199 Seal Systems [Product Data Sheet](#) for more detailed information on specific Rosemount Remote Seals.

A remote seal system consists of a pressure transmitter, a remote diaphragm, and either a direct mount or capillary style connection filled with a secondary fill fluid.

1.2 Product recycling/disposal

Recycling of equipment and packaging should be taken into consideration and disposed of in accordance with local and national legislation/regulations.

Figure 2-2. FFW Seal and Components



2.3 Understanding seal system performance

2.3.1 Volume temperature effects (process temperature effects)

Fill fluids expand or contract with temperature changes, creating a volume change that is absorbed by the diaphragm seal and is seen as back pressure at the transmitter. This back pressure creates a shift in the transmitter reading. For symmetrical or balanced systems, this error is usually minimal due to the back pressure being equal on both sides. However, head temperature effect is still present.

Note

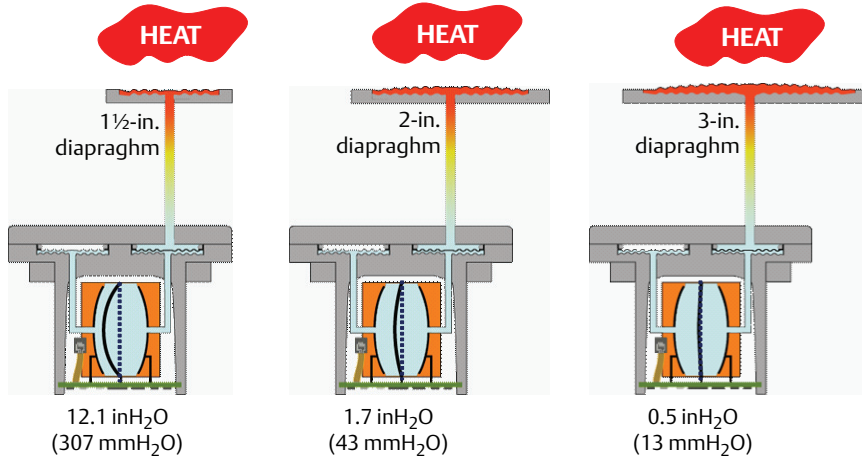
Other factors that affect seal temperature effect include diaphragm thickness, seal type and size, capillary length and inner diameter.

Figure 2-3 on page 5 shows how diaphragm size can affect the measurement reading at the transmitter. For smaller seal sizes, such as the 1½-in. size, the amount of back pressure on the transmitter causes an additional 12.1 inH₂O error. Moving to the 2-in. size gives 1.7 inH₂O and the largest 3-in. size shown only has 0.5 inH₂O error. Using a larger diaphragm can drastically improve performance and provides a more stable reading.

Note

Calculations done in Instrument Toolkit™ with Silicone 200 fill fluid with Rosemount™ 3051 Transmitter.

Figure 2-3. Back Pressure on Diaphragm Causing Error



Note

Diaphragm temperature effects decrease as seal size increases.

2.3.2 Density temperature effects (head temperature effects)

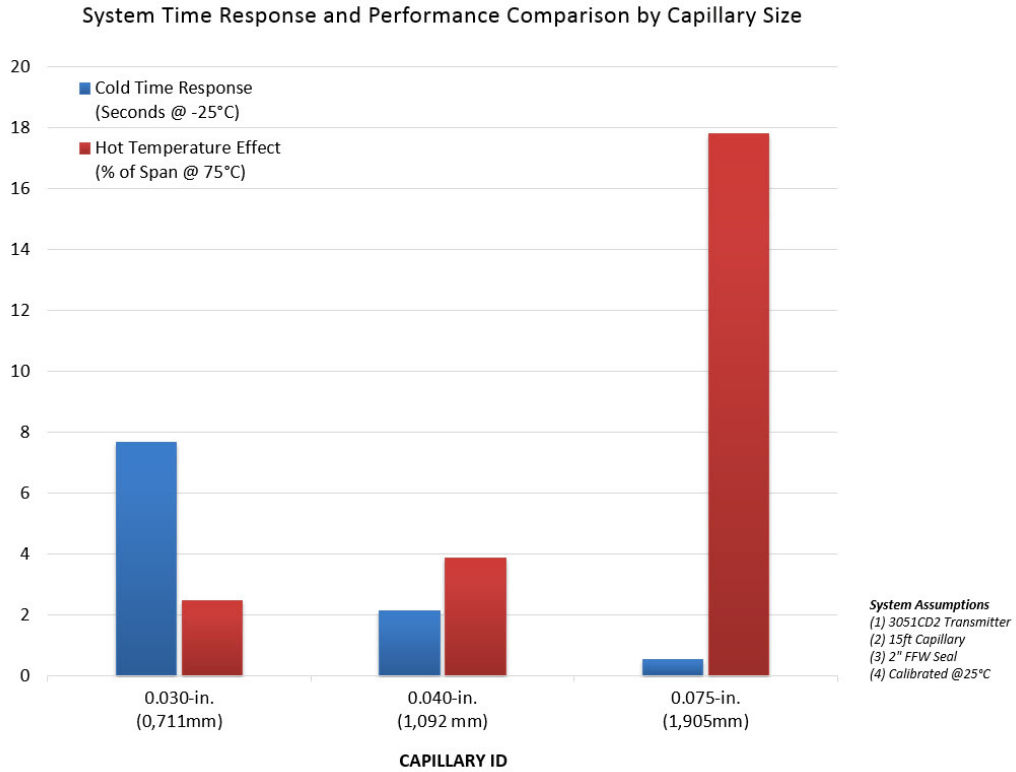
Density temperature effect is due to the change in specific gravity of the fill fluid caused by a change in ambient temperature. When installed, the weight of the fill fluid will produce an initial pressure read by the transmitter, equaling the height between the high and low connection taps multiplied by the fill fluid's specific gravity. As ambient temperature changes, the fill fluid specific gravity will change causing the weight of the fill fluid to change, thus changing the pressure read by the transmitter. Density effect will be seen in both

Tuned-System™ Assemblies and Balanced System Assemblies and will have the same impact on the transmitter regardless of where the transmitter is mounted.

2.3.3 System time response and performance

The time response of a system is based on the type of transmitter, its sensor range, the length and inner diameter (ID) of the capillary, and the viscosity of the fill fluid (which is directly affected by the process and ambient temperatures). These factors all play a role in the overall performance of any seal system. The relationship between system time response and temperature error is illustrated in Figure 2-4. It can be seen that changing the capillary ID has an inverse affect between the time response and temperature effect of a capillary system. As the capillary ID is increased, the time response of the system decreases while the temperature effect increases.

Figure 2-4. Response Time vs. Total Performance Example



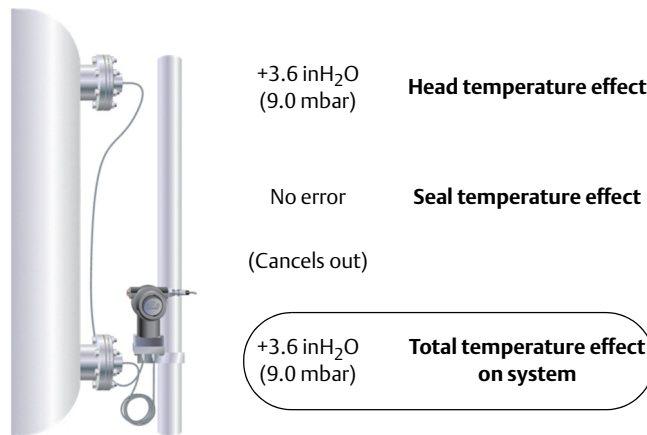
Note

Calculations conducted using Instrument Toolkit. Parameters: Silicone 200 fill fluid, Rosemount 3051CD2 Transmitter, 15 ft. capillary length, 2-in. FFW Seal, and calibrated at 25 °C.

2.4 Balanced vs. Tuned-System assemblies

A balanced remote seal system is a symmetrical system that utilizes equal seals and capillary length on the high and low pressure sides of the transmitter. Since the capillary lengths are the same, each side ideally has the same amount of fill fluid, minimizing or completely eliminating the seal temperature effect due to equal pressure on both sides of the transmitter diaphragm. The balanced systems are still affected by the head pressure as shown in [Figure 2-5](#).

Figure 2-5. Balanced System

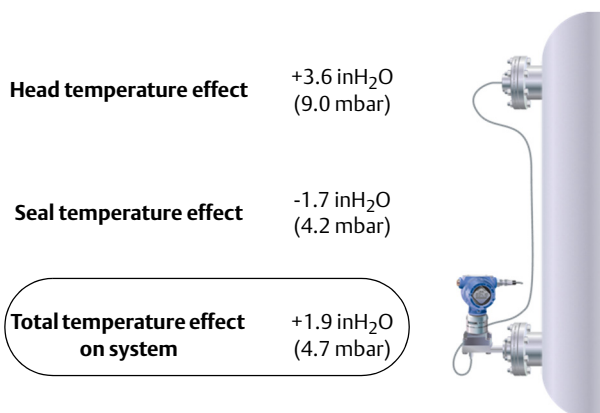


Note

Temperature effects were calculated in Instrument Toolkit using a 2-in. (DN 50) FFW seal, Silicone 200, 10 ft. (3 m) between the taps, over a 50 °F (28 °C) temperature change.

Tuned-Systems assemblies are asymmetrical remote seal systems with one seal directly mounted to the high side of the differential pressure transmitter, and the other side connected to a seal via capillary. Another possible Tuned-System assembly is any remote seal system with unequal lengths of capillary or two different remote seals on the high and low pressure connections. Due to the unequal lengths of capillary, there are seal temperature effects. However, this seal temperature effect counters the head pressure from the oil-filled capillary and reduces total temperature effects on the entire system.

Figure 2-6. Tuned-System Assembly



Note

Temperature effects were calculated in Instrument Toolkit using a 2-in. (DN 50) FFW seal, Silicone 200, 10 ft. (3 m) between the taps, over a 50 °F (28 °C) temperature change.

2.5 Specifying the right solution for vacuum applications

2.5.1 Vacuum application overview

When a vessel is operating in a vacuum (negative gauge pressure), it is important to specify the correct transmitter remote seal system to measure level accurately and reliably. Failure to do so can result in output drift or complete system failure. The combination of high process temperature and vacuum process pressure conditions creates additional requirements when specifying the transmitter remote seal system.

2.5.2 Vacuum applications

There are three primary transmitter-seal system components necessary to successfully specify vacuum application solutions:

- Seal system construction
- Fill fluid selection
- Transmitter mounting position

2.5.3 Seal system construction for vacuum applications

Emerson™ offers welded-repairable or all-welded vacuum system construction styles on diaphragm seal assemblies.

The all-welded vacuum construction was designed specifically for vacuum applications. In this construction, the sensor module gaskets are removed and a disk is welded over the sensor isolators. This eliminates the possibility of air being drawn into the seal system in deep vacuum conditions. This premium design is strongly suggested for vacuum pressures below 6 psia (310 mmHgA).

2.5.4 Transmitter mounting position

Mounting the pressure transmitter at or below the bottom vessel tap is an important factor to ensure a stable measurement with vacuum applications. The static pressure limit for a differential pressure transmitter is 0.5 psia (25 mmHgA), which ensures the transmitter sensor module fill fluid remains within the liquid phase of the vapor pressure curve.

If the vessel static limit is below 0.5 psia, mounting the transmitter below the bottom tap provides a capillary fill fluid head pressure on the module. A general rule is to always mount the transmitter approximately 3 ft. (1 m) below the bottom tap of the vessel.

2.5.5 Fill fluid selection

When the process is under vacuum conditions, the fill fluid can vaporize at a lower temperature than when it is under normal atmospheric or greater pressure. Each fill fluid has a specific vapor-pressure curve. The vapor-pressure curve indicates the pressure and temperature relationship where the fluid is in a liquid or a vapor state. Proper seal operation requires the fill fluid to remain in a liquid state.

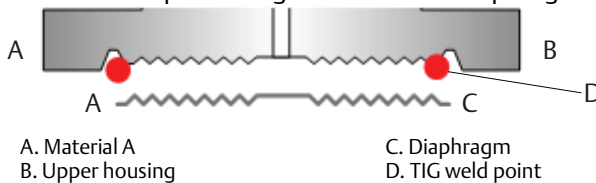
For vacuum applications, specify fluids that are specifically designed for use in these types of applications such as Silicone 704 for vacuum applications, Silicone 705 for vacuum applications, or UltraTherm™ 805 for vacuum applications. These fluids have been specially processed to deliver the maximum vapor pressure curve performance possible. For more information on Rosemount Diaphragm Seal fill fluids, reference the Rosemount 1199 Fill Fluid Specifications [Technical Note](#).

2.6 Diaphragm weld types

Weld-type is factory-determined as best for the seal typed specified. PFW and FFW seals have ordering options that specify welding options.

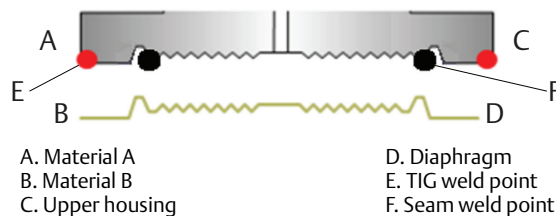
2.6.1 Solid faceplate design

The solid faceplate design is used when diaphragm and upper housing material are the same.



2.6.2 Seam weld design

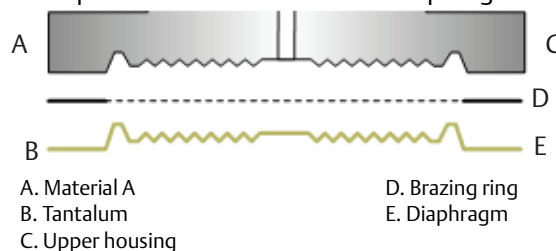
A seam weld design is used when the upper housing material is different from the diaphragm material. The seam welded design has a hermetic weld at the inner diameter of the diaphragm and a TIG weld at the outer edge. The diaphragm floats on the upper housing over the gasket surface area and could tear if a metallic gasket were used.



2.6.3 Brazed design

This process uses a brazing ring where the metals are brazed to attach the diaphragm to the upper housing. This allows the gasket surface area to solidify as it is melted to the upper housing.

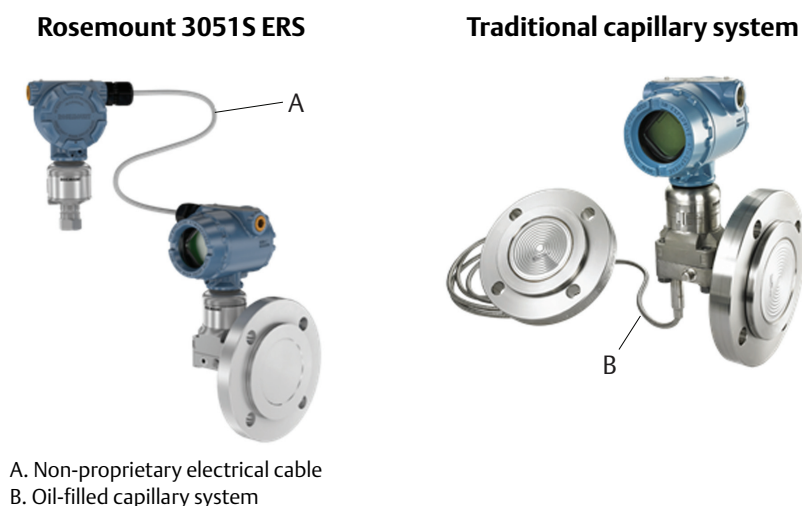
This option is used with Tantalum diaphragm when a metallic gasket is required.



2.7 Differences between electronic remote sensors and capillary systems

Rosemount 3051S Electronic Remote Sensors (ERS™) System technology utilizes two Rosemount 3051S Pressure Transmitters connected via an electrical wire instead of a single pressure transmitter with remote seals and capillary tubing. As the Rosemount 3051S ERS System calculates the differential pressure between the two transmitters, capillary tubing is not needed, and thus eliminates all head temperature affects on the system. Seals are not required, but may still be necessary on certain applications that include high temperature, corrosive, or viscous processes. For more information, refer to the Rosemount 3051S Series [Product Data Sheet](#).

Figure 2-7. ERS vs. Capillary



2.8 Instrument Toolkit: seal ordering and application process

Rosemount Instrument Toolkit Software is an instrumentation specification tool that can be used to assist in product selection. This program analyzes application and process conditions against a configured Rosemount model number and calculates the total system performance including expected head and seal temperature effects and system response times.

Visit the Emerson website for information on how to obtain and use Instrument Toolkit.

2.9 Rosemount Thermal Range Expander: proper use and applications

Figure 2-8. Rosemount Thermal Range Expander



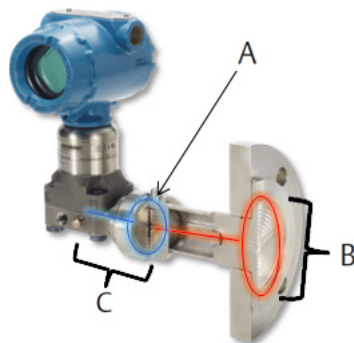
The Rosemount Thermal Range Expander increases the application range where DP Level technology can be used by expanding the ambient and process temperature ranges of the system.

Traditional remote seal systems are filled with a single fill fluid to operate in applications with varying ambient and process conditions. Silicone 704 and 705 are commonly used fluids for hot process applications going above 570 °F (300 °C); these fluids must be kept above 32 °F (0 °C) and 68 °F (20 °C), respectively, in order to properly transmit the pressure signal to the transmitter. This can prove to be difficult for outdoor installations where extremely cold ambient conditions cause these fill fluids to gel.

The Rosemount Thermal Range Expander is a seal system that uses two different fill fluids to extend the operating temperature range of the system. A high temperature fill fluid, which is next to the hot process, is kept warm enough to stay responsive. A second fill fluid, located on the other side of the intermediate diaphragm, operates over a wide ambient temperature range. The Rosemount Thermal Range Expander can operate in ambient temperatures as low as -75 °C (-103 °F), and process temperatures up to 410 °C (770 °F). This improves response time up to 46 percent and eliminates the need for mechanical heat tracing.

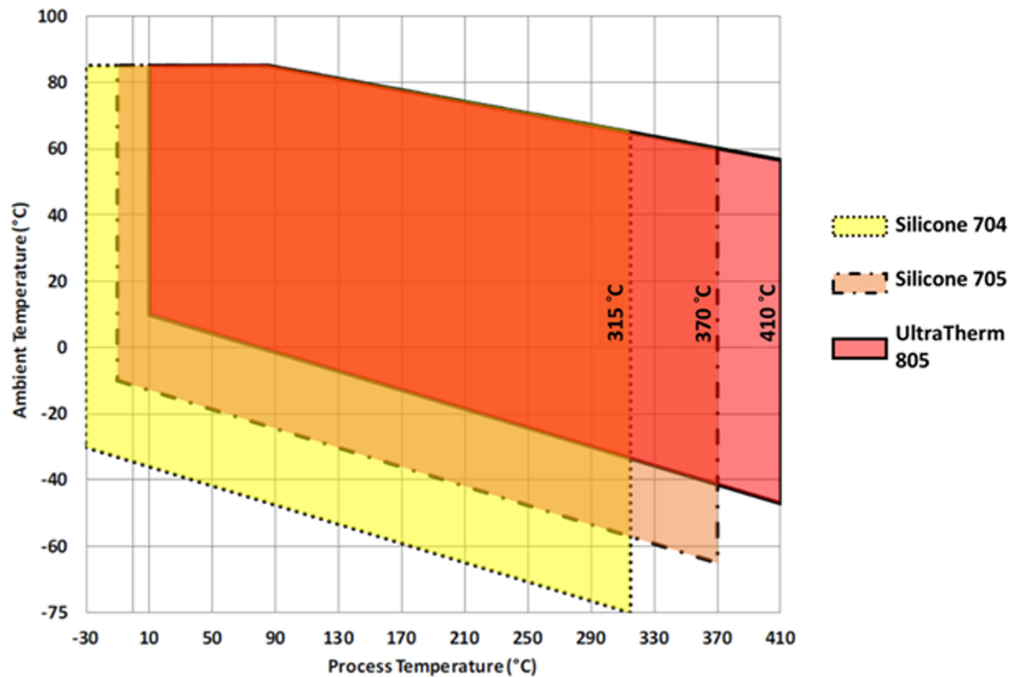
The Rosemount Thermal Range Expander can be used with any Rosemount 3051S DP Level configuration including Balanced Systems, Tuned-System Assemblies, Electronic Remote Sensors (ERS), or direct mounted to a transmitter.

Figure 2-9. Rosemount Thermal Range Expander Fill Fluids



- A. Intermediate diaphragm
- B. High temperature fill fluid (viscous)
- C. Ambient temperature fill fluid

Figure 2-10. Rosemount Thermal Range Expander Temperature Operating Range



2.10 Thermal optimizer: proper use and applications

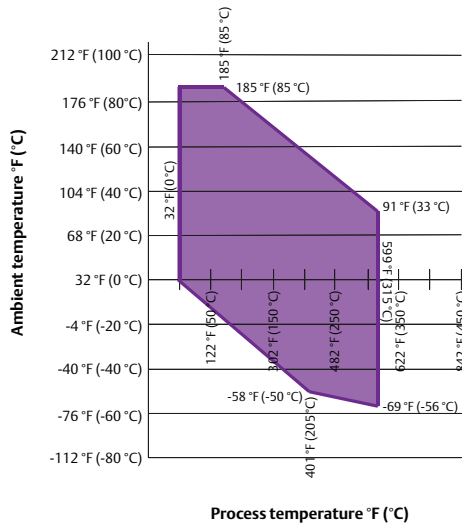
Figure 2-11. Thermal Optimizer



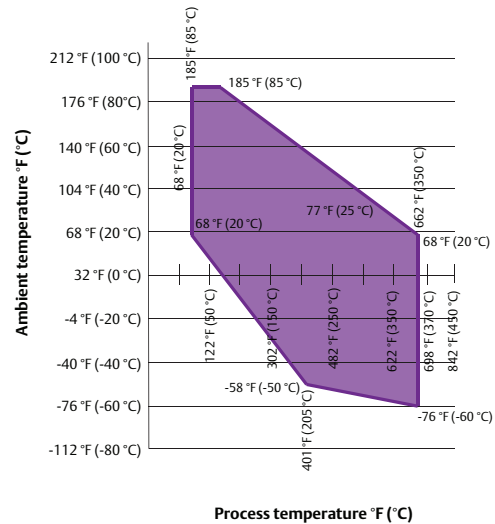
The thermal optimizer keeps fill fluids from gelling in cold ambient temperatures by using high process temperatures to heat the transmitter and capillary.

High temperature silicone fill fluid has a low temperature limit in ambient conditions below 32 °F (0 °C). The thermal optimizer allows direct mounting down to -94 °F (-70 °C).

Figure 2-12. Fill Fluid Temperature Limits
Thermal optimizer with Silicone 704



Thermal optimizer with Silicone 705



2.10.1 Thermal optimizer limitations

Figure 2-12 shows the process and ambient temperature limits for the thermal optimizer with Silicone 704 and Silicone 705 Fill Fluids respectively. The shaded areas represent the temperature limitations; applications outside of the shaded area cannot be used with a thermal optimizer.

For example, an application with an ambient temperature of 50 °F (10 °C) and a process temperature of 300 °F (149 °C) is within the limits, a thermal optimizer can be used in this application.

However, an application with an ambient temperature of 120 °F (40 °C) and a process temperature of 464 °F (240 °C) is outside of the limits. These high temperatures would be detrimental to the transmitter electronics.

2.11 Submersible seal

2.11.1 Designed for top-down measurement

The submersible seal consists of a bellows-style seal and is designed for measuring level in top-down applications with small tank connections, specifically 1.5-in. NPT threaded connections or 2- to 4-in. flanges. For tanks with larger connections or open process measurements, an RTW seal should be specified as it will provide a more accurate measurement.

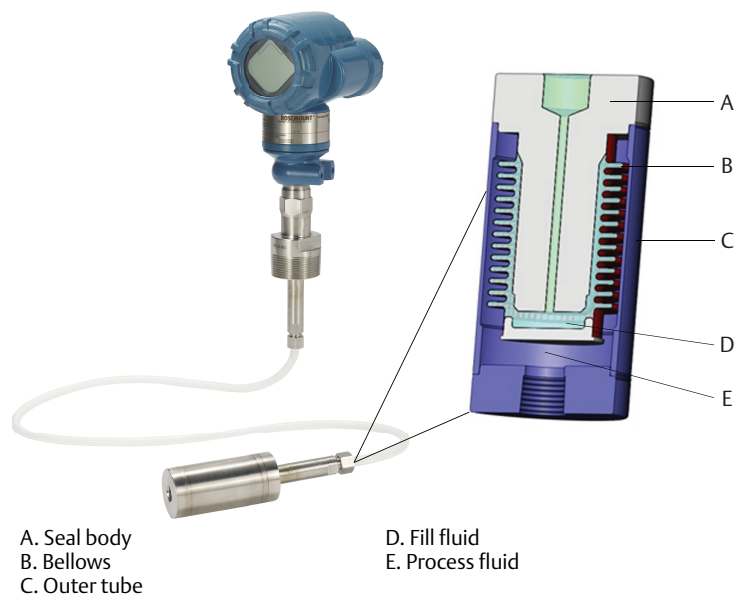
Apart from traditional DP Level transmitters, this new design has both the seal and capillary submerged in the process as shown below. Traditional DP Level seal systems are side mounted to tanks such that the diaphragm seal is the only wetted material that comes in direct contact with the process fluid.

This assembly can only be ordered with Rosemount in-line transmitters for gage measurements. Differential and absolute measurements are not available.

2.11.2 Submersible Seal features

- Specifically designed for top-down process measurements
- Bellows-style seal absorbs pressures efficiently for smaller process connections
- Threaded or flanged process connections
- Uses proven and reliable DP Level remote seals
- Up to 30 ft. (9,1m) of capillary

Figure 2-13. Rosemount Submersible Seal attached to a Rosemount 3051T Wireless Pressure Transmitter



Section 3 Installation

Seals handling and installation	page 15
Gaskets	page 17
Tagging	page 18
Max working pressure	page 18
FFW flush flanged seal	page 19
RFW off-line flanged seal	page 29
EFW extended flanged seal	page 33
PFW pancake seal	page 42
FCW flush flanged seal—ring type joint (RTJ) gasket surface	page 45
RCW off-line ring type joint (RTJ) flanged seal	page 48
FUW flush flanged groove type seals	page 50
FVW flush flanged tongue type seals	page 51
RTW off-line threaded type seals	page 53
HTS male threaded seal	page 55
SCW hygienic Tri-Clover Tri Clamp seals	page 56
SSW hygienic tank spud seal	page 58
STW hygienic thin wall tank spud seal	page 61
EES hygienic flanged tank spud extended seal	page 62
VCS Tri Clamp In-line seal	page 63
SVS VARIVENT compatible hygienic connection seal	page 64
SHP hygienic Cherry-Burrell “I” line seal	page 65
SLS dairy process connection—female thread seal per DIN 11851	page 66
WSP saddle seal	page 67
UCP union connection pipe mount seal	page 69
PMW paper mill sleeve seal	page 71
CTW chemical tee seal	page 73
TFS wafer style In-line seal	page 74
WFW flow-thru flanged seal	page 75

Additional specialized remote seals are available. Contact Emerson™ Technical Support for installation information on these seals.

3.1 Seals handling and installation

3.1.1 Diaphragm

The remote seal diaphragm is designed to withstand pressure and wear from process, but outside of process connection conditions, remote seals are delicate and should be handled with care.

The protective cover should remain on the seal until the moment before installation. Try to avoid touching the diaphragm with fingers or objects and refrain from setting the diaphragm side of the seal down on a hard surface.

Even minor dents or scratches in the diaphragm material may impair the performance of the seal system assembly. Care should be taken to ensure the seal diaphragm is not dented or damaged during seal installation.

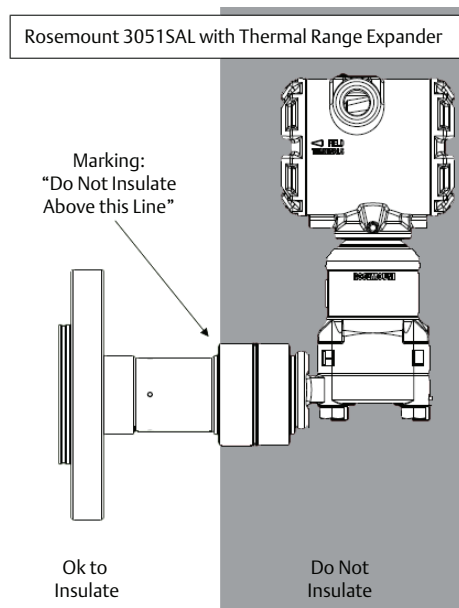
3.1.2 Capillary

When unpacking or handling seal system assemblies, do not lift the seal or transmitter by gripping the capillaries. Avoid sharply bending or crimping the capillary tubing. The minimum bending radius of the capillary tubing is 3-in. (8 cm).

3.1.3 Rosemount Thermal Range Expander

The Rosemount™ Thermal Range Expander system uses the heat from the process in order to keep both fluids within the system functioning properly; therefore insulation is not always required. However, it is always best practice to insulate systems to keep them functioning with optimum performance. The Rosemount Thermal Range Expander should never be insulated above the line marked on the seal itself.

Figure 3-1. Rosemount 3051SAL with Rosemount Thermal Range Expander Insulation Guidelines



3.1.4 Heat tracing

When using heat or steam tracing, exercise caution if PVC coating is added onto capillary, as PVC coating should not be exposed to temperatures above 212 °F (100 °C) to avoid the possibility of thermal breakdown.

Best practice for heat and steam tracing is to regulate the temperature slightly above the maximum ambient temperature for a consistent result. To avoid accuracy effects and thermal stress, the capillary should not be partially heated.

⚠ CAUTION

NEVER attempt to disconnect the seals or capillaries from the transmitter or loosen bolts. Doing so will result in loss of fill fluid and will void the product warranty.

Failing to recognize incorrect materials during installation may cause process leaks, which can result in damage to the diaphragm seal system or death and/or serious injury to personnel. Proper wetted material is required for specific process materials.

3.2 Gaskets

⚠ When installing remote seal systems which employ a gasket or a gasket and flushing connection ring, make sure the gasket is aligned properly on the gasket sealing surface. The user is responsible to ensure the gasket used does not exceed the temperature limits of the process. Failure to properly install the gasket may cause process leaks, which can result in death or serious injury.

In addition, make sure the gasket does not press down upon the diaphragm face. Anything pressing on the diaphragm will be read by the transmitter as pressure. A misaligned gasket may cause a false reading.

The intermediate gasket between the seal and lower housing is supplied when the lower housing or flushing connection is provided. The default gaskets are listed in [Table 3-1](#) based on seal type. The process gasket must be supplied by the end user. Tantalum diaphragms are not supplied with default gasket, so a gasket option must be selected when applicable.

If a lower housing is supplied, then the following gaskets are the default gaskets for each seal unless another gasket option is selected.

Table 3-1. Gaskets Materials

Seal type	Gaskets
Flanged seals assemblies	
FFW	Thermo-Tork® TN-9000
RFW	Klinger C-4401
EFW	No gasket is supplied
PFW	Thermo-Tork TN-9000
FCW	No gasket is supplied
RCW	Klinger C-4401
FUW/FVW	No gasket is supplied
Threaded seal assemblies	
RTW	Klinger C-4401
HTS	No gasket is supplied
Hygienic seal assemblies	
SCW ⁽¹⁾	No gasket is supplied
SSW	Ethylene propylene O-ring
STW	Ethylene propylene O-ring
EES	No gasket is supplied
VCS ⁽¹⁾	No gasket is supplied
SVS ⁽¹⁾	No gasket is supplied
SHP	No gasket is supplied
SLS ⁽¹⁾	No gasket is supplied
MLS ⁽¹⁾	No gasket is supplied

Table 3-1. Gaskets Materials

Specialty seals	
WSP	Klinger C-4401
UCP	Barium-Sulfate filled PTFE O-ring
CTW	No gasket is supplied
TFW	No gasket is supplied
WFW	Klinger C-4401

1. Ensure to use EHEDG approved gasket for EHEDG conformity.

Note

The end-user is responsible for choosing a gasket and ensuring the process temperature does not exceed the temperature limits of the gasket used. Failure to properly install the gasket may cause process leaks, which can result in death or serious injury.

3.3 Tagging

Each remote seal system is tagged in accordance with the end-user requirements. The remote seal model number is identified on the transmitter label, shown in Figure 3-2, 3-3, and 3-4.

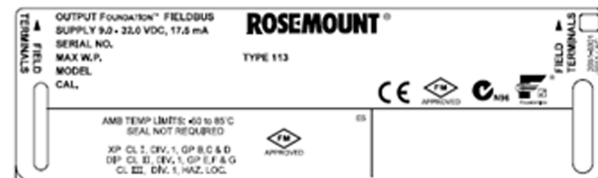
Figure 3-2. Rosemount 3051S Sample Label



Figure 3-3. Rosemount 3051 Sample Label



Figure 3-4. Rosemount 2051 Sample Label

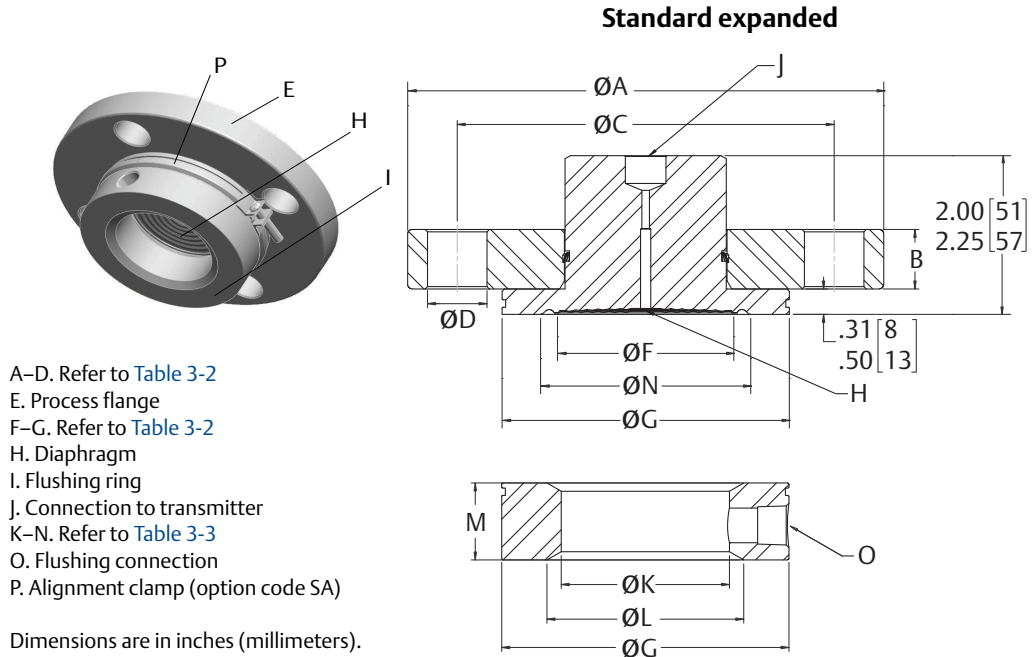


3.3.1 Max working pressure

The maximum working pressure (MWP) of the seal system assembly is stamped on the transmitter neck tag. This can be dependent upon the maximum pressure rating of the seal system or transmitter upper range limit.

3.4 FFW flush flanged seal

Figure 3-5. FFW Two-Piece Design (Shown with Flushing Ring)



Note

For the two-piece design, the seal assembly and process flange are separate components and can be rotated independent of each other. The Alignment clamp (P) can be ordered using option code SA.

Table 3-2. FFW Two-Piece (Upper Housing and Flange) Design Dimensions

	Pipe size	Class	Flange diameter "A" in. (mm)	Flange thickness "B" in. (mm)	Bolt circle "C" in. (mm)	Number of bolts	Bolt hole diameter "D" in. (mm)	Standard diaphragm diameter "F" in. (mm)	Raised face outer diameter "G" in. (mm)
ANSI/ASME	2-in.	150 lb	6.00 (152)	0.69 (18)	4.75 (121)	4	0.75 (19)	2.30 (58)	3.62 (92)
		300 lb	6.50 (165)	0.81 (21)	5.00 (127)	8	0.75 (19)	2.30 (58)	3.62 (92)
		600 lb	6.50 (165)	1.00 (25)	5.00 (127)	8	0.75 (19)	2.30 (58)	3.62 (92)
		900 lb	8.50 (216)	1.50 (38)	6.50 (165)	8	1.00 (25)	2.30 (58)	3.62 (92)
		1500 lb	8.50 (216)	1.50 (38)	6.50 (165)	8	1.00 (25)	2.30 (58)	3.62 (92)
		2500 lb	9.25 (235)	2.00 (51)	6.75 (172)	8	1.13 (29)	2.30 (58)	3.62 (92)

Table 3-2. FFW Two-Piece (Upper Housing and Flange) Design Dimensions

	Pipe size	Class	Flange diameter "A" in. (mm)	Flange thickness "B" in. (mm)	Bolt circle "C" in. (mm)	Number of bolts	Bolt hole diameter "D" in. (mm)	Standard diaphragm diameter "F" in. (mm)	Raised face outer diameter "G" in. (mm)
ANSI/ASME	3-in.	150 lb	7.50 (191)	0.88 (22)	6.00 (152)	4	0.75 (19)	3.50 (89)	5.00 (127)
		300 lb	8.25 (210)	1.06 (27)	6.62 (168)	8	0.88 (22)	3.50 (89)	5.00 (127)
		600 lb	8.25 (210)	1.25 (32)	6.62 (168)	8	0.88 (22)	3.50 (89)	5.00 (127)
		900 lb	9.50 (241)	1.50 (38)	7.50 (191)	8	1.00 (25)	3.50 (89)	5.00 (127)
		1500 lb	10.50 (267)	1.88 (48)	8.00 (203)	8	1.25 (32)	3.50 (89)	5.00 (127)
		2500 lb	12.00 (305)	2.62 (67)	9.00 (229)	8	1.38 (35)	3.50 (89)	5.00 (127)
	4-in.	150 lb	9.00 (229)	0.88 (22)	7.50 (191)	8	0.75 (19)	3.50 (89)	6.20 (157)
		300 lb	10.0 (254)	1.19 (30)	7.88 (200)	8	0.88 (22)	3.50 (89)	6.20 (157)
		600 lb	10.75 (273)	1.50 (38)	8.50 (216)	8	1.00 (25)	3.50 (89)	6.20 (157)
		900 lb	11.50 (292)	1.75 (45)	9.25 (235)	8	1.25 (32)	3.50 (89)	6.20 (157)
		1500 lb	12.25 (311)	2.12 (54)	9.50 (241)	8	1.38 (35)	3.50 (89)	6.20 (157)
		2500 lb	14.00 (356)	3.00 (76)	10.75 (274)	8	1.63 (41)	3.50 (89)	6.20 (157)
EN1092-1	DN 50	PN 40	6.50 (165)	0.67 (17)	4.92 (125)	4	0.71 (18)	2.30 (58)	4.00 (102)
		PN 63	7.09 (180)	0.91 (23)	5.31 (135)	4	0.87 (22)	2.30 (58)	4.00 (102)
		PN 100	7.68 (195)	0.99 (25)	5.71 (145)	4	1.02 (26)	2.30 (58)	4.00 (102)
		PN 160	7.68 (195)	1.06 (27)	5.71 (145)	4	1.02 (26)	2.30 (58)	4.00 (102)
	DN 80	PN 40	7.87 (200)	0.83 (21)	6.30 (160)	8	0.71 (18)	3.50 (89)	5.43 (138)
		PN 63	8.46 (215)	0.99 (25)	6.69 (170)	8	0.88 (22)	3.50 (89)	5.43 (138)
		PN 100	9.06 (230)	1.15 (29)	7.09 (180)	8	1.02 (26)	3.50 (89)	5.43 (138)
		PN 160	9.06 (230)	1.30 (33)	7.09 (180)	8	1.02 (26)	3.50 (89)	5.43 (138)
	DN 100	PN 10/16	8.66 (220)	0.67 (17)	7.09 (180)	8	0.71 (18)	3.50 (89)	6.20 (157)
		PN 40	9.25 (235)	0.94 (24)	7.48 (190)	8	0.87 (22)	3.50 (89)	6.20 (157)
		PN 63	9.84 (250)	0.83 (21)	7.87 (200)	8	1.02 (26)	3.50 (89)	6.20 (157)
		PN 100	10.43 (265)	1.30 (27)	8.27 (210)	8	1.18 (30)	3.50 (89)	6.20 (157)
		PN 160	10.43 (265)	1.46 (37)	8.27 (210)	8	1.18 (30)	3.50 (89)	6.20 (157)

Table 3-2. FFW Two-Piece (Upper Housing and Flange) Design Dimensions

	Pipe size	Class	Flange diameter "A" in. (mm)	Flange thickness "B" in. (mm)	Bolt circle "C" in. (mm)	Number of bolts	Bolt hole diameter "D" in. (mm)	Standard diaphragm diameter "F" in. (mm)	Raised face outer diameter "G" in. (mm)
JIS	50A	10K	6.10 (155)	0.63 (16)	4.72 (120)	4	0.75 (19)	2.30 (58)	3.62 (92)
		20K	6.10 (155)	0.71 (18)	4.72 (120)	8	0.75 (19)	2.30 (58)	3.62 (92)
		40K	6.50 (165)	1.02 (26)	5.12 (130)	8	0.75 (19)	2.30 (58)	4.00 (102)
	80A	10K	7.28 (185)	0.71 (18)	5.91 (150)	8	0.75 (19)	3.50 (89)	5.00 (127)
		20K	7.87 (200)	0.87 (22)	6.30 (160)	8	0.91 (23)	3.50 (89)	5.00 (127)
		40K	8.27 (210)	1.26 (32)	6.69 (170)	8	0.91 (23)	3.50 (89)	5.43 (138)
	100A	10K	8.27 (210)	0.71 (18)	6.89 (175)	8	0.75 (19)	3.50 (89)	6.20 (157)
		20K	8.86 (225)	0.95 (24)	7.28 (185)	8	0.91 (23)	3.50 (89)	6.20 (157)
		40K	9.84 (250)	1.42 (36)	8.07 (205)	8	0.98 (25)	3.50 (89)	6.20 (157)

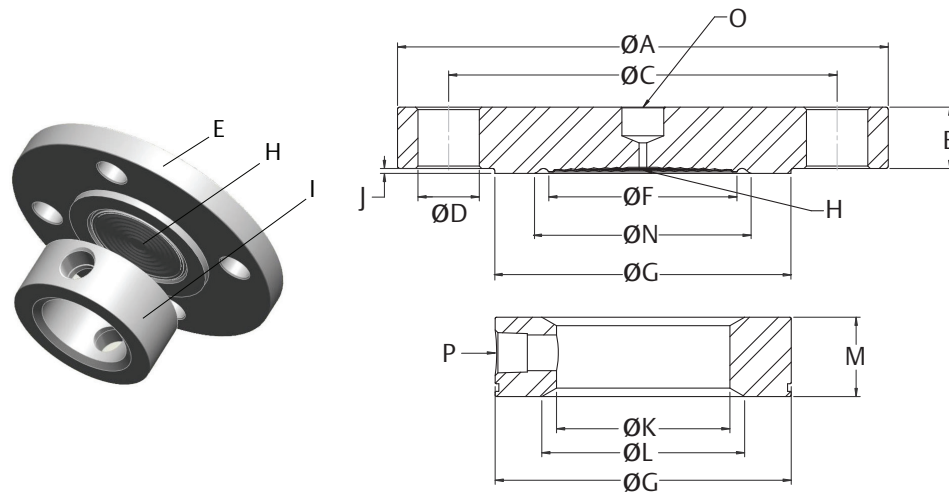
Table 3-3. FFW Flush Connection Ring Dimensions

	Pipe size	Class	Inner diameter "K" in. (mm)	Beveled edge "L" in. (mm)	Thickness "M" in. (mm)		Minimum gasket I.D. "N" in. (mm)	Weight lb (kg)
					1/4-in. NPT flush connection	1/2-in. NPT flush connection		
ANSI/ASME	2-in.	150 lb	2.12 (54)	2.48 (63)	0.97 (25)	1.30 (33)	2.50 (64)	7.40 (3,33)
		300 lb	2.12 (54)	2.48 (63)	0.97 (25)	1.30 (33)	2.50 (64)	8.99 (4,05)
		600 lb	2.12 (54)	2.48 (63)	0.97 (25)	1.30 (33)	2.50 (64)	10.44 (4,70)
		900 lb	2.12 (54)	2.48 (63)	0.97 (25)	1.30 (33)	2.50 (64)	24.62 (11,08)
		1500 lb	2.12 (54)	2.48 (63)	0.97 (25)	1.30 (33)	2.50 (64)	24.62 (11,08)
		2500 lb	2.12 (54)	2.48 (63)	0.97 (25)	1.30 (33)	2.50 (64)	36.71 (16,52)
	3-in.	150 lb	3.60 (91)	N/A	0.97 (25)	1.30 (33)	3.70 (94)	13.79 (6,21)
		300 lb	3.60 (91)	N/A	0.97 (25)	1.30 (33)	3.70 (94)	17.84 (8,03)
		600 lb	3.60 (91)	N/A	0.97 (25)	1.30 (33)	3.70 (94)	20.31 (9,14)
		900 lb	3.60 (91)	N/A	0.97 (25)	1.30 (33)	3.70 (94)	33.21 (14,94)
		1500 lb	3.60 (91)	N/A	0.97 (25)	1.30 (33)	3.70 (94)	46.76 (21,04)
		2500 lb	3.60 (91)	N/A	0.97 (25)	1.30 (33)	3.70 (94)	81.34 (36,60)

Table 3-3. FFW Flush Connection Ring Dimensions

	Pipe size	Class	Inner diameter "K" in. (mm)	Beveled edge "L" in. (mm)	Thickness "M" in. (mm)		Minimum gasket I.D. "N" in. (mm)	Weight lb (kg)
					1/4-in. NPT flush connection	1/2-in. NPT flush connection		
ANSI/ASME	4-in.	150 lb	3.60 (91)	N/A	0.97 (25)	1.30 (33)	3.70 (94)	19.56 (8,80)
		300 lb	3.60 (91)	N/A	0.97 (25)	1.30 (33)	3.70 (94)	29.56 (13,30)
		600 lb	3.60 (91)	N/A	0.97 (25)	1.30 (33)	3.70 (94)	40.73 (18,33)
		900 lb	3.60 (91)	N/A	0.97 (25)	1.30 (33)	3.70 (94)	53.16 (23,92)
		1500 lb	3.60 (91)	N/A	0.97 (25)	1.30 (33)	3.70 (94)	71.72 (32,27)
		2500 lb	3.60 (91)	N/A	0.97 (25)	1.30 (33)	3.70 (94)	125.72 (56,57)
EN1092-1	DN 50	PN 40	2.40 (61)	N/A	0.97 (25)	1.30 (33)	2.50 (64)	9.02 (4,06)
		PN 63	2.40 (61)	N/A	0.97 (25)	1.30 (33)	2.50 (64)	12.58 (5,66)
		PN 100	2.40 (61)	N/A	0.97 (25)	1.30 (33)	2.50 (64)	15.23 (6,85)
		PN 160	2.40 (61)	N/A	0.97 (25)	1.30 (33)	2.50 (64)	16.12 (7,25)
	DN 80	PN 40	3.60 (91)	N/A	0.97 (25)	1.30 (33)	3.70 (94)	15.03 (6,76)
		PN 63	3.60 (91)	N/A	0.97 (25)	1.30 (33)	3.70 (94)	18.87 (8,49)
		PN 100	3.60 (91)	N/A	0.97 (25)	1.30 (33)	3.70 (94)	23.34 (10,50)
		PN 160	3.60 (91)	N/A	0.97 (25)	1.30 (33)	3.70 (94)	25.83 (11,62)
	DN 100	PN 10/16	3.60 (91)	N/A	0.97 (25)	1.30 (33)	3.70 (94)	16.08 (7,24)
		PN 40	3.60 (91)	N/A	0.97 (25)	1.30 (33)	3.70 (94)	20.31 (9,14)
		PN 63	3.60 (91)	N/A	0.97 (25)	1.30 (33)	3.70 (94)	26.74 (12,03)
		PN 100	3.60 (91)	N/A	0.97 (25)	1.30 (33)	3.70 (94)	34.26 (15,42)
PN 160		3.60 (91)	N/A	0.97 (25)	1.30 (33)	3.70 (94)	37.44 (16,85)	
JIS	50A	10K	2.12 (54)	N/A	0.97 (25)	1.30 (33)	2.62 (67)	6.93 (3,15)
		20K	2.12 (54)	N/A	0.97 (25)	1.30 (33)	2.62 (67)	7.11 (3,20)
		40K	2.40 (61)	N/A	0.97 (25)	1.30 (33)	2.62 (67)	10.41 (4,68)
	80A	10K	3.60 (91)	N/A	0.97 (25)	1.30 (33)	3.82 (97)	10.52 (4,73)
		20K	3.60 (91)	N/A	0.97 (25)	1.30 (33)	3.82 (97)	13.61 (6,12)
		40K	3.60 (91)	N/A	0.97 (25)	1.30 (33)	3.82 (97)	20.08 (9,04)
	100A	10K	3.60 (91)	N/A	0.97 (25)	1.30 (33)	3.82 (97)	14.03 (6,31)
		20K	3.60 (91)	N/A	0.97 (25)	1.30 (33)	3.82 (97)	19.16 (8,62)
		40K	3.60 (91)	N/A	0.97 (25)	1.30 (33)	3.82 (97)	32.12 (14,45)

Figure 3-6. FFW One-Piece Design (Shown with Flushing Ring)



A–D. Refer to Table 3-4
E. Process flange
F–G. Refer to Table 3-4
H. Diaphragm

I. Flushing ring
J–N. Refer to Table 3-4 and Table 3-5
O. Connection to transmitter
P. Flushing connection

Dimensions are in inches (millimeters).

Note

Alignment clamp (option code SA) not available on FFW one-piece design.

Table 3-4. FFW One-Piece (Upper Housing and Flange) Design (Option Code E) Dimensions

	Pipe size	Class	Flange diameter "A" in. (mm)	Flange thickness "B" in. (mm)	Bolt circle "C" in. (mm)	Number of bolts	Bolt hole diameter "D" in. (mm)	Standard diaphragm diameter "F" in. (mm)	Raised face diameter "G" in. (mm)	Raised face height "J" in. (mm)	Minimum gasket I.D. "N" in. (mm)	Weight lb (kg)
ANSI/ASME	2-in.	150 lb	6.00 (152)	0.69 (18)	4.75 (121)	4	0.75 (19)	2.30 (58)	3.62 (92)	0.06 (1,50)	2.5 (64)	7.40 (3,33)
		300 lb	6.50 (165)	0.81 (21)	5.00 (127)	8	0.75 (19)	2.30 (58)	3.62 (92)	0.06 (1,50)	2.5 (64)	8.99 (4,05)
		600 lb	6.50 (165)	1.00 (25)	5.00 (127)	8	0.75 (19)	2.30 (58)	3.62 (92)	0.25 (6,40)	2.5 (64)	10.44 (4,70)
		900/1500 lb	8.50 (216)	1.50 (38)	6.50 (165)	8	1.00 (25)	2.30 (58)	3.62 (92)	0.25 (6,40)	2.5 (64)	24.62 (11,08)
		2500 lb	9.25 (235)	2.00 (51)	6.75 (172)	8	1.13 (29)	2.30 (58)	3.62 (92)	0.25 (6,40)	2.5 (64)	36.71 (16,52)

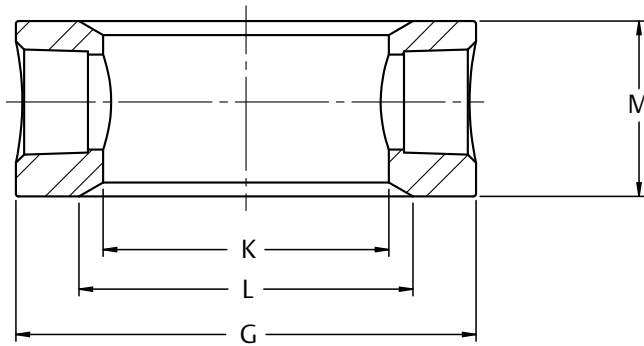
Table 3-4. FFW One-Piece (Upper Housing and Flange) Design (Option Code E) Dimensions

	Pipe size	Class	Flange diameter "A" in. (mm)	Flange thickness "B" in. (mm)	Bolt circle "C" in. (mm)	Number of bolts	Bolt hole diameter "D" in. (mm)	Standard diaphragm diameter "F" in. (mm)	Raised face diameter "G" in. (mm)	Raised face height "J" in. (mm)	Minimum gasket I.D. "N" in. (mm)	Weight lb (kg)
ANSI/ASME	3-in.	150 lb	7.50 (191)	0.88 (22)	6.00 (152)	4	1.13 (25)	3.50 (89)	5.00 (127)	0.06 (1,50)	3.70 (94)	13.79 (6,21)
		300 lb	8.25 (210)	1.06 (27)	6.62 (168)	8	0.88 (22)	3.50 (89)	5.00 (127)	0.06 (1,50)	3.70 (94)	17.84 (8,03)
		600 lb	8.25 (210)	1.25 (32)	6.62 (168)	8	0.88 (22)	3.50 (89)	5.00 (127)	0.25 (6,40)	3.70 (94)	20.31 (9,14)
		900 lb	9.50 (241)	1.50 (38)	7.50 (229)	8	1.00 (25)	3.50 (89)	5.00 (127)	0.25 (6,40)	3.70 (94)	33.21 (14,94)
		1500 lb	10.50 (267)	1.88 (48)	8.00 (203)	8	1.25 (32)	3.50 (89)	5.00 (127)	0.25 (6,40)	3.70 (94)	46.76 (21,04)
		2500 lb	12.00 (305)	2.62 (67)	9.00 (229)	8	1.38 (35)	3.50 (89)	5.00 (127)	0.25 (6,40)	3.70 (94)	81.34 (36,60)
	4-in.	150 lb	9.00 (229)	0.88 (22)	7.50 (191)	8	0.75 (19)	3.50 (89)	6.20 (157)	0.06 (1,50)	3.70 (94)	19.56 (8,80)
		300 lb	10.00 (254)	1.19 (30)	7.88 (200)	8	0.88 (22)	3.50 (89)	6.20 (157)	0.06 (1,50)	3.70 (94)	29.56 (8,80)
		600 lb	10.75 (273)	1.50 (38)	8.50 (216)	8	1.00 (25)	3.50 (89)	6.20 (157)	0.25 (6,40)	3.70 (94)	40.73 (18,33)
		900 lb	11.50 (292)	1.75 (45)	9.25 (235)	8	1.25 (32)	3.50 (89)	6.20 (157)	0.25 (6,40)	3.70 (94)	53.16 (23,92)
		1500 lb	12.25 (311)	2.12 (54)	9.50 (241)	8	1.38 (35)	3.50 (89)	6.20 (157)	0.25 (6,40)	3.70 (94)	71.72 (32,27)
		2500 lb	14.00 (356)	3.00 (76)	10.75 (274)	8	1.63 (41)	3.50 (89)	6.20 (157)	0.25 (6,40)	3.70 (94)	125.72 (56,57)
EN 1092-1	DN50	PN 40	6.50 (165)	0.67 (17)	4.92 (125)	4	0,71 (18)	2.30 (58)	4.00 (102)	0.12 (3,00)	2.50 (64)	9.02 (4,06)
		PN 63	7.08 (180)	0.91 (23)	5.31 (135)	4	0.87 (22)	2.30 (58)	4.00 (102)	0.12 (3,00)	2.50 (64)	12.58 (5,66)
		PN 100	7.68 (195)	0.99 (25)	5.71 (145)	4	1.02 (26)	2.30 (58)	4.00 (102)	0.12 (3,00)	2.50 (64)	15.23 (6,85)
		PN160	7.68 (195)	1.06 (27)	5.71 (145)	4	1.02 (26)	2.30 (58)	4.00 (102)	0.12 (3,00)	2.50 (64)	16.12 (7,25)

Table 3-4. FFW One-Piece (Upper Housing and Flange) Design (Option Code E) Dimensions

	Pipe size	Class	Flange diameter "A" in. (mm)	Flange thickness "B" in. (mm)	Bolt circle "C" in. (mm)	Number of bolts	Bolt hole diameter "D" in. (mm)	Standard diaphragm diameter "F" in. (mm)	Raised face diameter "G" in. (mm)	Raised face height "J" in. (mm)	Minimum gasket I.D. "N" in. (mm)	Weight lb (kg)
EN 1092-1	DN80	PN 40	7.87 (200)	0.83 (21)	6.30 (160)	8	0.71 (18)	3.50 (89)	5.43 (138)	0.12 (3,0)	3.70 (94)	15.03 (6,76)
		PN 63	8.46 (215)	0.99 (25)	6.69 (170)	8	0.88 (22)	3.50 (89)	5.43 (138)	0.12 (3,0)	3.70 (94)	18.87 (8,49)
		PN 100	9.06 (230)	1.15 (29)	7.09 (180)	8	1.02 (26)	3.50 (89)	5.43 (138)	0.12 (3,0)	3.70 (94)	23.34 (10,50)
		PN160	9.06 (230)	1.30 (33)	7.09 (180)	8	1.02 (26)	3.50 (89)	5.43 (138)	0.12 (3,0)	3.70 (94)	25.83 (11,62)
	DN100	PN 10/ PN 16	8.66 (220)	0.67 (17)	7.09 (180)	8	0.71 (18)	3.50 (89)	6.20 (157)	0.12 (3,0)	3.70 (94)	16.08 (7,24)
		PN 40	9.25 (235)	0.83 (21)	7.48 (190)	8	0.87 (22)	3.50 (89)	6.20 (157)	0.12 (3,0)	3.70 (94)	20.31 (9,14)
		PN 63	9.84 (250)	1.07 (27)	7.87 (200)	8	1.02 (26)	3.50 (89)	6.20 (157)	0.12 (3,0)	3.70 (94)	26.74 (1203)
		PN 100	10.43 (265)	1.30 (33)	8.27 (210)	8	1.18 (30)	3.50 (89)	6.20 (157)	0.12 (3,0)	3.70 (94)	34.26 (15,42)
		PN 160	10.43 (265)	1.46 (37)	8.27 (210)	8	1.18 (30)	3.50 (89)	6.20 (157)	0.12 (3,0)	3.70 (94)	37.44 (16,85)
	JIS	50A	10K	6.1 (155)	0.63 (16)	4.72 (120)	4	0.75 (19)	2.30 (58)	3.62 (92)	0.08 (2,0)	2.50 (64)
20K			6.1 (155)	0.71 (18)	4.72 (120)	8	0.75 (19)	2.30 (58)	3.62 (92)	0.08 (2,0)	2.50 (64)	7.11 (3,20)
40K			6.5 (165)	1.02 (26)	5.12 (130)	8	0.75 (19)	2.30 (58)	4.00 (102)	0.08 (2,0)	2.50 (64)	10.41 (4,68)
80A		10K	7.28 (185)	0.71 (18)	5.91 (150)	8	0.75 (19)	3.50 (89)	5.00 (127)	0.08 (2,0)	3.70 (94)	10.52 (4,73)
		20K	7.87 (200)	0.87 (22)	6.3 (160)	8	0.91 (23)	3.50 (89)	5.00 (127)	0.08 (2,0)	3.70 (94)	13.61 (6,12)
		40K	8.27 (210)	1.26 (32)	6.69 (170)	8	0.91 (23)	3.50 (89)	5.43 (138)	0.08 (2,0)	3.70 (94)	20.08 (9,04)
100A		10K	8.27 (210)	0.71 (18)	6.89 (175)	8	0.75 (19)	3.50 (89)	6.20 (157)	0.08 (2,0)	3.70 (94)	14.03 (6,31)
		20K	8.86 (225)	0.95 (24)	7.28 (185)	8	0.91 (23)	3.50 (89)	6.20 (157)	0.08 (2,0)	3.70 (94)	19.16 (8,62)
		40K	9.84 (250)	1.42 (36)	8.07 (205)	8	0.98 (25)	3.50 (89)	6.20 (157)	0.08 (2,0)	3.70 (94)	32.12 (14,45)

Figure 3-7. FFW Flushing Connection Ring (Lower Housing)



G, K, L, M. Refer to Table 3-5

Table 3-5. FFW Flushing Connection Ring (Lower Housing) Dimensions

	Pipe size	Class	Raised face diameter "G" in. (mm)	Inner diameter "K" in. (mm)	Beveled edge "L" in. (mm)	Thickness "M" in. (mm)		Weight lb (kg)
						1/4-in. NPT flush connection	1/2-in. NPT flush connection	
ANSI/ASME	2-in.	150 lb	3.62 (92)	2.12 (54)	2.48 (63)	0.97 (25)	1.30 (33)	7.41 (3,33)
		300 lb	3.62 (92)	2.12 (54)	2.48 (63)	0.97 (25)	1.30 (33)	8.99 (4,05)
		600 lb	3.62 (92)	2.12 (54)	2.48 (63)	0.97 (25)	1.30 (33)	10.44 (4,70)
		900/1500 lb	3.62 (92)	2.12 (54)	2.48 (63)	0.97 (25)	1.30 (33)	24.62 (11,08)
		2500 lb	3.62 (92)	2.12 (54)	2.48 (63)	0.97 (25)	1.30 (33)	36.71 (16,52)
	3-in.	150 lb	5.00 (127)	3.60 (91)	N/A	0.97 (25)	1.30 (33)	13.79 (6,21)
		300 lb	5.00 (127)	3.60 (91)	N/A	0.97 (25)	1.30 (33)	17.84 (8,03)
		600 lb	5.00 (127)	3.60 (91)	N/A	0.97 (25)	1.30 (33)	20.31 (9,14)
		900 lb	5.00 (127)	3.60 (91)	N/A	0.97 (25)	1.30 (33)	33.21 (14,94)
		1500 lb	5.00 (127)	3.60 (91)	N/A	0.97 (25)	1.30 (33)	46.76 (21,04)
		2500 lb	5.00 (127)	3.60 (91)	N/A	0.97 (25)	1.30 (33)	81.34 (36,60)
	4-in.	150 lb	6.20 (157)	3.60 (91)	N/A	0.97 (25)	1.30 (33)	19.56 (8,80)
		300 lb	6.20 (157)	3.60 (91)	N/A	0.97 (25)	1.30 (33)	29.56 (13,30)
		600 lb	6.20 (157)	3.60 (91)	N/A	0.97 (25)	1.30 (33)	40.73 (18,33)
		900 lb	6.20 (157)	3.60 (91)	N/A	0.97 (25)	1.30 (33)	53.16 (23,92)
		1500 lb	6.20 (157)	3.60 (91)	N/A	0.97 (25)	1.30 (33)	71.72 (32,27)
		2500 lb	6.20 (157)	3.60 (91)	N/A	0.97 (25)	1.30 (33)	125.72 (56,57)

Table 3-5. FFW Flushing Connection Ring (Lower Housing) Dimensions

	Pipe size	Class	Raised face diameter "G" in. (mm)	Inner diameter "K" in. (mm)	Beveled edge "L" in. (mm)	Thickness "M" in. (mm)		Weight lb (kg)
						1/4-in. NPT flush connection	1/2-in. NPT flush connection	
EN1092-1	DN 50	PN 40	4.00 (102)	2.40 (61)	N/A	0.97 (25)	1.30 (33)	9.02 (4,06)
		PN 63	4.00 (102)	2.40 (61)	N/A	0.97 (25)	1.30 (33)	12.58 (5,66)
		PN 100	4.00 (102)	2.40 (61)	N/A	0.97 (25)	1.30 (33)	15.23 (6,85)
		PN 160	4.00 (102)	2.40 (61)	N/A	0.97 (25)	1.30 (33)	16.12 (7,25)
	DN 80	PN 40	5.43 (138)	3.60 (91)	N/A	0.97 (25)	1.30 (33)	15.03 (6,76)
		PN 63	5.43 (138)	3.60 (91)	N/A	0.97 (25)	1.30 (33)	18.87 (8,49)
		PN 100	5.43 (138)	3.60 (91)	N/A	0.97 (25)	1.30 (33)	23.34 (10,50)
		PN 160	5.43 (138)	3.60 (91)	N/A	0.97 (25)	1.30 (33)	25.83 (11,62)
	DN 100	PN 10/16	6.20 (157)	3.60 (91)	N/A	0.97 (25)	1.30 (33)	16.08 (7,24)
		PN 40	6.20 (157)	3.60 (91)	N/A	0.97 (25)	1.30 (33)	20.31 (9,14)
		PN 63	6.20 (157)	3.60 (91)	N/A	0.97 (25)	1.30 (33)	26.74 (12,03)
		PN 100	6.20 (157)	3.60 (91)	N/A	0.97 (25)	1.30 (33)	34.26 (15,42)
PN 160		6.20 (157)	3.60 (91)	N/A	0.97 (25)	1.30 (33)	37.44 (16,85)	
JIS	50A	10K	3.62 (92)	2.12 (54)	N/A	0.97 (25)	1.30 (33)	6.93 (3,15)
		20K	3.62 (92)	2.12 (54)	N/A	0.97 (25)	1.30 (33)	7.11 (3,20)
		40K	4.00 (102)	2.40 (61)	N/A	0.97 (25)	1.30 (33)	10.41 (4,68)
	80A	10K	5.00 (127)	3.60 (91)	N/A	0.97 (25)	1.30 (33)	10.52 (4,73)
		20K	5.00 (127)	3.60 (91)	N/A	0.97 (25)	1.30 (33)	13.61 (6,12)
		40K	5.43 (138)	3.60 (91)	N/A	0.97 (25)	1.30 (33)	20.08 (9,04)
	100A	10K	6.20 (157)	3.60 (91)	N/A	0.97 (25)	1.30 (33)	14.03 (6,31)
		20K	6.20 (157)	3.60 (91)	N/A	0.97 (25)	1.30 (33)	19.16 (8,62)
		40K	6.20 (157)	3.60 (91)	N/A	0.97 (25)	1.30 (33)	32.12 (14,45)

3.4.1 Parts required for installation


The parts required to install the FFW flush flanged seal will be defined here. Prior to installation, you will need a standard wrench, a torque wrench, and the applicable (Phillips or slotted) screwdriver.

Although best practice is to use the same gasket type as is being used to connect the flushing ring to the process, the provided gasket may be used once you have verified the Emerson-supplied gasket material is appropriate for the application.

Inspect bolts to ensure the material is compatible with industry standards per the application such as ASME PCC-1-2010.

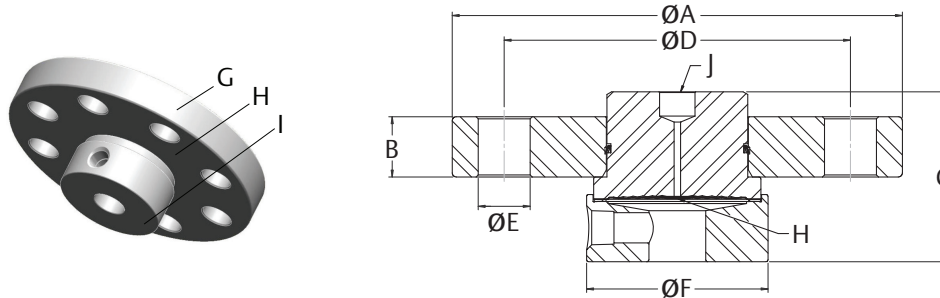
3.4.2 Installation steps

Follow these steps to install the FFW flush flanged seal on an existing process flange:

1. Remove the plastic cover from the diaphragm of the remote seal.
2. If the FFW seal was ordered with both a flushing ring (option codes A, B, 2, H, 6, or V) and an alignment clamp (option code SA); then the alignment clamp should be first used to attach the flushing ring to the seal using [Step 3](#). If no alignment clamp was purchased, proceed to [Step 4](#).
3. Using the alignment clamp, attach the flushing ring to the diaphragm seal with a gasket between the two. The clamp fits in the machined groove on both the remote seal and the flushing ring. Using the applicable screwdriver, tighten the screw on the clamp to hold the flushing ring in place.
4. If a flushing ring was purchased but no alignment clamp, then ensure that a gasket is placed between the diaphragm seal and flushing ring prior to bolting the components to the tank/pipe.
5. Flushing rings may be ordered with none, one, or two threaded connections, or can be supplied by the factory with plugs or drain vent valves. Ensure flushing connections are sealed before completing installation.
6. Put the washers on the bolts.
7. Insert two bolts in the bottom bolt holes of the flange on the remote seal. Bolts are installed this way to avoid interference with the tank/pipe and to facilitate inspection of bolt material if required.
-  8. Place the appropriate gasket for the application on the remote seal or optional flushing ring and align the gasket so that it is not inside the diaphragm weld as this will induce errors. Failure to properly install the gasket may cause process leaks, which can result in death or serious injury.
9. Using the previously installed bolts, attach the remote seal and gasket to the process connection.
10. Loosely fasten the nuts onto the bolts.
11. Insert two bolts in the top bolt holes of the flange on the remote seal and hand-tighten the nuts.
12. Using a torque wrench on the bolt head and a standard wrench on the nut, tighten the assembly in a cross-pattern to ensure even installation. The bolts should be torqued to the applicable flange requirements. Required torque is a function of the gasket material and surface treatment of the bolts and nuts which are end-user-supplied. For four bolts, the tightening pattern should be 1, 3, 2, 4; for eight bolts, the tightening pattern should be 1, 5, 3, 7, 2, 6, 4, 8; for twelve bolts the tightening pattern should be 1, 9, 5, 3, 11, 7, 2, 10, 6, 4, 12, 8. Tighten 20 to 30 percent, check the gap, tighten 50 to 70 percent, check flange gap and uniformity, and continue to tighten in the appropriate pattern until you reach 100 percent torque value. Time permitting, wait a minimum of four hours and repeat the torque pattern to restore any short term creep/relaxation in the connection. Consider leak checking the installation to ensure a robust connection.

3.5 RFW off-line flanged seal

Figure 3-8. RFW Standard Design



A-F. Refer to Table 3-6
G. Process flange
H. Diaphragm

I. Lower housing or flushing connection
J. Connection to transmitter

Dimensions are in inches (millimeters).

Table 3-6. RFW Standard Design Dimensions⁽¹⁾

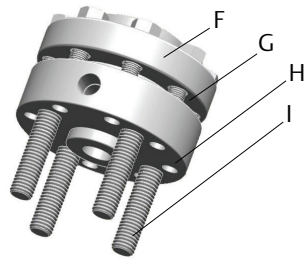
	Pipe size	Class	Flange diameter "A" in. (mm)	Flange thickness "B" in. (mm)	Overall height "C" in. (mm)		Bolt circle diameter "D" in. (mm)	Bolt hole diameter "E" in. (mm)	Lower housing diameter "F" in. (mm)	Weight lb (kg)
					No or 1/4-in. NPT flush connection	1/2-in. NPT flush connection				
ANSI/ASME	1/2-in.	2500 lb	5.25 (133)	1.19 (30)	2.45 (62)	2.79 (71)	3.25 (83)	0.75 (19)	2.62 (67)	8.49 (3,82)
	3/4-in.	300/600 lb	4.62 (117)	0.62 (16)	2.45 (62)	2.79 (71)	3.25 (83)	0.88 (22)	2.62 (67)	4.99 (2,25)
		900/1500 lb	5.12 (130)	1.00 (25)	2.45 (62)	2.79 (71)	3.50 (89)	0.88 (22)	2.62 (67)	7.25 (3,26)
		2500 lb	5.50 (140)	1.25 (32)	2.45 (62)	2.79 (71)	3.75 (95)	0.88 (22)	2.62 (67)	9.52 (4,28)
	1-in.	150 lb	4.25 (108)	0.50 (13)	2.45 (62)	2.79 (71)	3.12 (79)	0.75 (19)	2.62 (67)	4.19 (1,89)
		300 lb	4.88 (124)	0.62 (16)	2.45 (62)	2.79 (71)	3.50 (89)	0.63 (16)	2.62 (67)	5.30 (2,39)
		600 lb	4.88 (124)	0.69 (18)	2.45 (62)	2.79 (71)	3.50 (89)	0.75 (19)	2.62 (67)	5.58 (2,51)
		900/1500 lb	5.88 (150)	1.12 (29)	2.45 (62)	2.79 (71)	4.00 (102)	1.00 (25)	2.62 (67)	9.68 (4,36)
		2500 lb	6.25 (159)	1.38 (35)	2.45 (62)	2.79 (71)	4.25 (108)	1.00 (25)	2.87 (73)	13.68 (6,16)

Table 3-6. RFW Standard Design Dimensions⁽¹⁾

	Pipe size	Class	Flange diameter "A" in. (mm)	Flange thickness "B" in. (mm)	Overall height "C" in. (mm)		Bolt circle diameter "D" in. (mm)	Bolt hole diameter "E" in. (mm)	Lower housing diameter "F" in. (mm)	Weight lb (kg)
					No or 1/4-in. NPT flush connection	1/2-in. NPT flush connection				
ANSI/ASME	1 1/2-in.	150 lb	5.00 (127)	0.62 (16)	2.45 (62)	2.79 (71)	3.50 (89)	0.63 (22)	2.62 (67)	5.63 (2,53)
		300 lb	6.12 (155)	0.75 (19)	2.45 (62)	2.79 (71)	3.88 (99)	0.75 (19)	2.88 (73)	8.20 (3,69)
		600 lb	6.12 (155)	0.88 (22)	2.45 (62)	2.79 (71)	4.50 (114)	0.88 (22)	2.88 (73)	9.09 (4,09)
		900 lb	7.00 (178)	1.25 (32)	2.45 (62)	2.79 (71)	4.50 (114)	0.88 (22)	2.88 (73)	14.48 (6,52)
		1500 lb	7.00 (178)	1.25 (32)	2.45 (62)	2.79 (71)	4.88 (124)	1.13 (29)	2.88 (73)	14.48 (6,62)
		2500 lb	8.00 (203)	1.75 (45)	2.45 (62)	2.79 (71)	5.75 (146)	1.25 (32)	2.88 (73)	25.34 (11,40)
EN 1092-1	DN 25	PN 40	4.53 (115)	0.71 (18)	2.45 (62)	2.79 (71)	3.35 (85)	0.55 (14)	2.68 (68)	5.09 (2,29)
	DN 40	PN 40	5.91 (150)	0.71 (18)	2.45 (62)	2.79 (71)	4.33 (110)	0.71 (18)	3.47 (88)	8.04 (3,62)
JIS	20A	40K	4.72 (120)	0.79 (20)	2.45 (62)	2.79 (71)	3.35 (85)	0.75 (19)	2.62 (67)	5.59 (2,52)
	25A	10K	4.92 (125)	0.55 (14)	2.45 (62)	2.79 (71)	3.54 (90)	0.75 (19)	2.62 (67)	5.00 (2,25)
		20K	4.92 (125)	0.63 (16)	2.45 (62)	2.79 (71)	3.54 (90)	0.75 (19)	2.62 (67)	5.31 (2,39)
		40K	5.12 (130)	0.87 (22)	2.45 (62)	2.79 (71)	3.74 (95)	0.75 (19)	2.76 (70)	6.86 (3,09)
	40A	10K	5.51 (140)	0.63 (16)	2.45 (62)	2.79 (71)	4.13 (105)	0.75 (19)	3.19 (81)	6.20 (2,79)
		20K	5.51 (140)	0.71 (18)	2.45 (62)	2.79 (71)	4.13 (105)	0.75 (19)	3.19 (81)	7.36 (3,31)
		40K	6.30 (160)	0.94 (24)	2.45 (62)	2.79 (71)	4.72 (120)	0.91 (23)	3.54 (90)	11.06 (4,98)

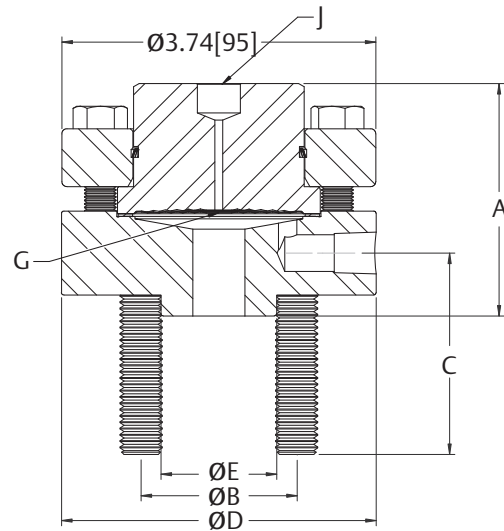
1. Lower housing is loose on standard design, consult factory for retained lower housing options.

Figure 3-9. RFW Stud Bolt Design



A–E. Refer to Table 3-7
 F. Upper housing
 G. Diaphragm
 H. Lower housing or flushing connection
 I. Bolts
 J. Connection to transmitter

Dimensions are in inches (millimeters).



Note

A lower housing/flushing connection is always required for the RFW type seal.

Table 3-7. RF/RFW Lower Housing Dimensions⁽¹⁾

	Pipe size	Class	Overall height "A" in. (mm)		Stud circle diameter "B" in. (mm)	Stud (size, length) "C" in. (mm)	Lower housing diameter "D" in. (mm)	Raised face diameter "E" in. (mm)	Weight lb (kg)
			No or 1/4-in. NPT flush connection	1/2-in. NPT flush connection					
ANSI/ASME	1/2-in.	150 lb	2.52 (64)	2.82 (72)	2.38 (61)	1/2–13 NC, 2.5-in.	3.74 (95)	1.38 (35)	6.28 (2,83)
		300/600 lb	2.77 (70)	2.87 (73)	2.62 (67)	1/2–13 NC, 2.5-in.	3.75 (95)	1.38 (35)	6.53 (2,94)
	3/4-in.	150 lb	2.52 (64)	2.82 (72)	2.75 (70)	1/2–13 NC, 2.5-in.	3.88 (99)	1.69 (43)	6.46 (2,91)
EN 1092-1	DN 15	PN 40	2.52 (64)	2.82 (72)	2.56 (65)	M12 × 1.75, 60 mm	3.74 (95)	1.77 (45)	6.27 (2,82)
		PN 100/PN 160	2.52 (64)	2.82 (72)	2.95 (75)	M12 × 1.75, 60 mm	4.13 (105)	1.77 (45)	6.92 (3,11)
	DN 20	PN 40	2.52 (64)	2.82 (72)	2.95 (75)	M12 × 1.75, 60 mm	4.13 (105)	2.28 (58)	6.90 (3,11)
JIS	10A	10/20K	2.52 (64)	2.82 (72)	2.56 (65)	M12 × 1.75, 60 mm	3.74 (95)	1.81 (46)	6.30 (2,84)
		40K	2.52 (64)	2.82 (72)	2.95 (75)	M16 × 2.00, 70 mm	4.33 (110)	2.05 (52)	7.70 (3,47)
	15A	10K	2.52 (64)	2.82 (72)	2.76 (70)	M12 × 1.75, 60 mm	3.74 (95)	2.01 (51)	6.39 (2,88)
		20K	2.52 (64)	2.82 (72)	2.76 (70)	M12 × 2.00, 60 mm	3.74 (95)	2.01 (51)	6.39 (2,88)
		40K	2.52 (64)	2.82 (72)	3.15 (80)	M16 × 2.00, 70 mm	4.53 (115)	2.17 (55)	8.26 (3,72)
	20A	10/20K	2.52 (64)	2.82 (72)	2.95 (75)	M12 × 1.75, 60 mm	3.94 (100)	2.21 (56)	6.68 (3,01)

1. Lower housing is loose on standard design, consult factory for retained lower housing options.

3.5.1 4.1-in. (104 mm) diaphragm diameter option

The standard diaphragm size for the RFW seal is 2.4-in. (61 mm). 2.9-in. (74 mm) and 4.1-in. (104 mm) sizes are offered for small spans, and reduce temperature error when taking process measurements.

3.5.2 Parts required for installation

The parts required to install the RFW remote flanged seal will be defined here. Prior to installation, you will need a standard wrench and a torque wrench.


Obtain the Emerson-supplied gasket required to assemble the seal to the process connection according to flange style and rating. Verify the gasket material is appropriate for the application.

Verify the Emerson-supplied gasket material is appropriate for the application. Inspect bolts to ensure the material is compatible with industry standards per the application such as ASME PCC-1-2010.

3.5.3 Installation steps

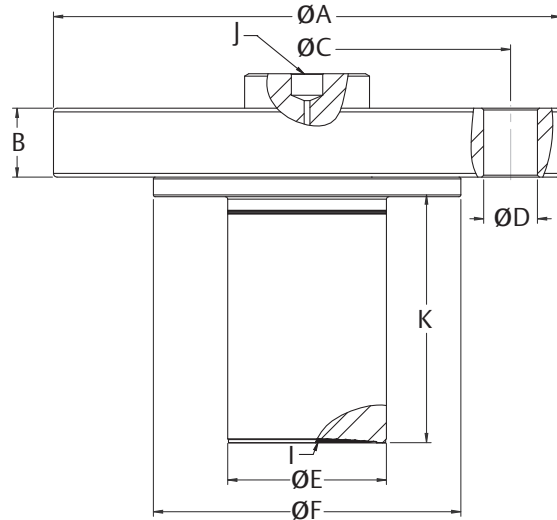
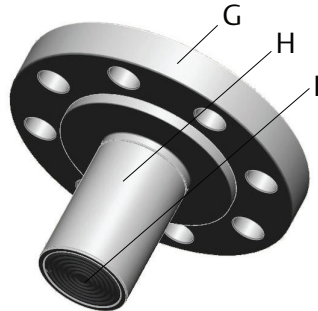
It is recommended that two people install the RFW remote flanged seal to ensure proper alignment during installation.

Follow these steps to install the RFW remote flanged seal on an existing process flange:

1. Remove the plastic cover from the diaphragm of the remote seal.
2. Put washers on the mounting bolts.
3. Assemble the flushing ring, Emerson-supplied gasket, and remote seal together. Place the Emerson-supplied gasket inside the recessed cavity within the flushing ring which is designed to hold the gasket in place.
-  4. Position the end-user-supplied gasket between the flushing ring/remote seal assembly and the process flange. Ensure that the end-user-supplied gasket is centered on both the process flange and the flushing connection. Ensure the flange bolt holes between the remote seal and the process flange are aligned. Failure to properly install the gasket may cause process leaks, and measurement errors which can result in death or serious injury.
5. Put the first bolt and washer through one of the holes on the bottom of the seal and process flange. Secure with a nut and hand-tighten. The head of the bolt should be visible from outside the assembly.
6. Install the remaining bolts in a cross pattern, hand-tightening the nuts as each bolt is installed.
7. Using a torque wrench on the bolt head and a standard wrench on the nut, tighten the assembly in a cross-pattern to ensure even installation. The bolts should be torqued to the applicable flange requirements. Required torque is a function of the gasket material and surface treatment of the bolts and nuts which are end-user-supplied. For four bolts, the tightening pattern should be 1, 3, 2, 4; for eight bolts, the tightening pattern should be 1, 5, 3, 7, 2, 6, 4, 8; for twelve bolts the tightening pattern should be 1, 9, 5, 3, 11, 7, 2, 10, 6, 4, 12, 8. Tighten 20 to 30 percent, check the gap, tighten 50 to 70 percent, check flange gap and uniformity, and continue to tighten in the appropriate pattern until you reach 100 percent torque value. Time permitting, wait a minimum of four hours and repeat the torque pattern to restore any short term creep/relaxation in the connection. Consider leak checking the installation to ensure a robust connection.

3.6 EFW extended flanged seal

Figure 3-10. EFW Extended Flanged Seal Assembly



- A–F. Refer to Table 3-8 and Table 3-9
- G. Process flange
- H. Extension
- I. Diaphragm
- J. Connection to transmitter
- K. Extension length (Refer to Table 3-10)

Dimensions are in inches (millimeters).

Note

Flush rings are not available with EFW. The provided gasket may be used once you have verified the Emerson-supplied gasket material is appropriate for the application.

Table 3-8. EFW Extended Flanged Seal Dimensions

	Pipe size	Class	Flange diameter "A" in. (mm)	Flange thickness "B" in. (mm)	Bolt circle "C" in. (mm)	Number of bolts	Bolt hole diameter "D" in. (mm)	Raised face diameter "F" in. (mm)
ANSI/ASME	1½-in.	150 lb	5.00 (127)	0.62 (16)	0.63 (16)	4	3.88 (99)	2.88 (73)
		300 lb	6.12 (156)	0.75 (19)	0.88 (22)	4	4.50 (114)	2.88 (73)
		600 lb	6.12 (156)	0.88 (22)	0.88 (22)	4	4.50 (114)	2.88 (73)
		900/1500 lb	7.00 (178)	1.25 (32)	1.13 (28)	4	4.88 (124)	2.88 (73)
		2500 lb	8.00 (203)	1.75 (45)	1.25 (32)	4	5.75 (146)	2.88 (73)
	2-in.	150 lb	6.00 (152)	0.69 (18)	0.75 (19)	4	4.75 (121)	3.62 (92)
		300 lb	6.50 (165)	0.82 (21)	0.75 (19)	8	5.00 (127)	3.62 (92)
		600 lb	6.50 (165)	1.00 (25)	0.75 (19)	8	5.00 (127)	3.62 (92)
		900/1500 lb	8.50 (216)	1.50 (38)	1.00 (25)	8	6.50 (165)	3.62 (92)
		2500 lb	9.25 (235)	2.00 (51)	1.13 (29)	8	6.75 (172)	3.62 (92)

Table 3-8. EFW Extended Flanged Seal Dimensions

	Pipe size	Class	Flange diameter "A" in. (mm)	Flange thickness "B" in. (mm)	Bolt circle "C" in. (mm)	Number of bolts	Bolt hole diameter "D" in. (mm)	Raised face diameter "F" in. (mm)	
ANSI/ASME	3-in.	150 lb	7.50 (191)	0.88 (22)	0.75 (19)	4	6.00 (152)	5.00 (127)	
		300 lb	8.25 (210)	1.06 (27)	0.88 (22)	8	6.62 (168)	5.00 (127)	
		600 lb	8.25 (210)	1.25 (32)	0.88 (22)	8	6.62 (168)	5.00 (127)	
		900 lb	9.50 (241)	1.50 (38)	1.00 (25)	8	7.50 (191)	5.00 (127)	
		1500 lb	10.50 (267)	1.88 (48)	1.25 (32)	8	8.00 (203)	5.00 (127)	
		2500 lb	12.00 (305)	2.62 (67)	1.38 (35)	8	9.00 (229)	5.00 (127)	
	4-in.	150 lb	9.00 (229)	0.88 (22)	0.75 (19)	8	7.50 (191)	6.20 (158)	
		300 lb	10.00 (254)	1.19 (30)	0.88 (22)	8	7.88 (200)	6.20 (158)	
		600 lb	10.75 (273)	1.50 (38)	1.00 (25)	8	8.50 (216)	6.20 (158)	
		900 lb	11.50 (292)	1.75 (45)	1.25 (32)	8	9.25 (235)	6.20 (158)	
		1500 lb	12.25 (311)	2.12 (54)	1.38 (35)	8	9.50 (241)	6.20 (158)	
		2500 lb	14.00 (356)	3.00 (76)	1.63 (41)	8	10.75 (274)	6.20 (158)	
EN 1092-1	DN 50	PN 40	6.50 (165)	0.67 (17)	0.71 (18)	4	4.92 (125)	4.02 (102)	
		PN 63	7.08 (180)	0.91 (23)	0.87 (22)	4	5.31 (135)	4.02 (102)	
		PN 100	7.68 (195)	0.98 (25)	1.02 (26)	4	5.71 (145)	4.02 (102)	
		PN 160	7.68 (195)	1.06 (27)	1.02 (26)	4	5.71 (145)	4.02 (102)	
	DN 80	PN 40	7.87 (200)	0.83 (21)	0.71 (18)	8	6.30 (160)	5.43 (138)	
		PN 63	8.46 (215)	0.98 (25)	0.88 (22)	8	6.69 (170)	5.43 (138)	
		PN 100	9.06 (230)	1.14 (29)	1.02 (26)	8	7.09 (180)	5.43 (138)	
		PN 160	9.06 (230)	1.30 (33)	1.02 (26)	8	7.09 (180)	5.43 (138)	
	DN 100	PN 10/16	8.66 (220)	0.67 (17)	0.71 (18)	8	7.09 (180)	6.20 (158)	
		PN 40	9.25 (235)	0.83 (21)	0.87 (22)	8	7.48 (190)	6.20 (158)	
		PN 63	9.84 (250)	1.06 (27)	1.02 (26)	8	7.87 (200)	6.20 (158)	
		PN 100	10.43 (265)	1.30 (33)	1.18 (30)	8	8.27 (210)	6.20 (158)	
		PN 160	10.43 (265)	1.46 (37)	1.18 (30)	8	8.27 (210)	6.20 (158)	
	JIS	50A	10K	6.10 (155)	0.63 (16)	0.75 (19)	4	4.72 (120)	3.62 (92)
			20K	6.10 (155)	0.71 (18)	0.75 (19)	8	4.72 (120)	3.62 (92)
40K			6.50 (165)	1.02 (26)	0.75 (19)	8	5.12 (130)	4.00 (102)	

Table 3-8. EFW Extended Flanged Seal Dimensions

	Pipe size	Class	Flange diameter "A" in. (mm)	Flange thickness "B" in. (mm)	Bolt circle "C" in. (mm)	Number of bolts	Bolt hole diameter "D" in. (mm)	Raised face diameter "F" in. (mm)
JIS	80A	10K	7.28 (185)	0.71 (18)	0.75 (19)	8	5.91 (150)	5.00 (127)
		20K	7.87 (200)	0.87 (22)	0.91 (23)	8	6.30 (160)	5.00 (127)
		40K	8.27 (210)	1.26 (32)	0.91 (23)	8	6.69 (170)	5.43 (138)
	100A	10K	8.27 (210)	0.71 (18)	0.75 (19)	8	6.89 (175)	6.20 (158)
		20K	8.86 (225)	0.94 (24)	0.91 (23)	8	7.28 (185)	6.20 (158)
		40K	9.84 (250)	1.42 (36)	0.98 (25)	8	8.07 (205)	6.20 (158)

Table 3-9. EFW Extended Flanged Seal Dimensions

Process connection size			Diameter "E" in. (mm)
ANSI B16.5	EN 1092-1	JIS B2238	
3-in.	DN 80	80A	2.58 (66)
4-in.	DN 100	100A	3.50 (89)
1½-in.	DN 40	40A	1.45 (37)
2-in.	DN 50	50A	1.90 (48)
3-in. headbox	DN 80 headbox	N/A	2.88 (73)
4-in. headbox	DN 100 headbox	N/A	3.78 (96)

Table 3-10. EFW Extended Flanged Seal Weights (lb [kg])

	Pipe size	Class	Extension length								
			1-in. (25 mm)	2-in. (51 mm)	3-in. (76 mm)	4-in. (102 mm)	5-in. (127 mm)	6-in. (152 mm)	7-in. (178 mm)	8-in. (203 mm)	9-in. (229 mm)
ANSI/ASME	1½-in.	150 lb	5.53 (2,49)	5.99 (2,70)	6.46 (2,91)	6.92 (3,11)	7.38 (3,32)	7.85 (3,53)	8.31 (3,74)	8.78 (3,95)	7.47 (3,36)
		300 lb	8.11 (3,65)	8.57 (3,86)	9.04 (4,07)	9.50 (4,28)	9.96 (4,48)	10.43 (4,69)	10.89 (4,90)	11.36 (5,11)	10.05 (4,52)
		600 lb	9.00 (4,05)	9.46 (4,56)	9.93 (4,47)	10.39 (4,68)	10.86 (4,89)	11.32 (5,09)	11.78 (5,30)	12.25 (5,51)	10.94 (4,92)
		900/1500 lb	15.19 (6,86)	15.66 (7,05)	16.12 (7,25)	16.59 (7,47)	17.05 (7,67)	17.51 (7,88)	17.98 (8,09)	18.44 (8,30)	18.70 (8,42)
		2500 lb	25.38 (11,42)	25.84 (11,63)	26.31 (11,84)	26.77 (12,05)	27.23 (12,25)	27.70 (12,47)	28.16 (12,67)	28.63 (12,88)	28.89 (13,00)

Table 3-10. EFW Extended Flanged Seal Weights (lb [kg])

	Pipe size	Class	Extension length								
			1-in. (25 mm)	2-in. (51 mm)	3-in. (76 mm)	4-in. (102 mm)	5-in. (127 mm)	6-in. (152 mm)	7-in. (178 mm)	8-in. (203 mm)	9-in. (229 mm)
ANSI/ASME	2-in.	150 lb	8.22 (3,70)	8.80 (3,96)	9.41 (4,23)	10.00 (4,50)	10.60 (4,77)	11.19 (5,04)	11.79 (5,31)	12.38 (5,57)	11.16 (5,02)
		300 lb	9.81 (4,41)	10.39 (4,68)	11.00 (4,95)	11.60 (5,22)	12.19 (5,49)	12.79 (5,76)	13.38 (6,02)	13.98 (6,29)	12.75 (5,74)
		600 lb	11.26 (5,07)	11.84 (5,33)	12.44 (5,60)	13.05 (5,87)	13.64 (6,14)	14.23 (6,40)	14.83 (6,67)	15.42 (6,94)	14.20 (6,39)
		900/ 1500 lb	25.50 (11,48)	26.31 (11,84)	27.12 (12,20)	27.92 (12,56)	28.73 (12,93)	29.54 (13,29)	30.34 (13,65)	31.15 (14,02)	31.32 (14,09)
		2500 lb	36.58 (16,46)	37.38 (16,82)	38.19 (17,19)	39.00 (17,55)	39.80 (17,91)	40.61 (18,27)	41.42 (18,64)	42.22 (19,00)	42.40 (19,08)
	3-in.	150 lb	15.89 (7,15)	17.64 (7,94)	19.48 (8,77)	21.27 (9,57)	23.08 (10,39)	24.88 (11,20)	26.69 (12,01)	28.50 (12,83)	22.47 (10,11)
		300 lb	19.94 (8,97)	21.69 (9,76)	23.53 (10,59)	25.32 (11,39)	27.13 (12,21)	28.93 (13,02)	30.74 (13,83)	32.54 (14,64)	26.52 (11,93)
		600 lb	22.43 (10,09)	24.18 (10,88)	26.02 (11,71)	27.81 (12,51)	29.62 (13,33)	31.42 (14,14)	33.23 (14,95)	35.03 (15,76)	29.01 (13,05)
		900 lb	33.26 (14,97)	35.10 (15,80)	36.90 (16,61)	38.71 (17,42)	40.51 (18,23)	42.32 (19,04)	44.12 (19,85)	45.93 (20,67)	48.80 (21,96)
		1500 lb	47.88 (21,55)	49.71 (22,37)	51.52 (23,18)	53.33 (24,00)	55.13 (24,81)	56.94 (25,62)	58.74 (26,43)	60.55 (27,25)	63.42 (28,54)
		2500 lb	83.46 (37,56)	85.30 (38,39)	87.10 (39,20)	88.91 (40,01)	90.71 (40,82)	92.52 (41,63)	94.33 (42,45)	96.13 (43,26)	99.00 (44,55)
	3-in. headbox	150 lb	15.76 (7,09)	17.40 (7,83)	19.07 (8,58)	20.90 (9,41)	22.40 (10,08)	24.07 (10,83)	25.74 (11,58)	27.41 (12,33)	23.24 (10,46)
		300 lb	19.81 (8,91)	21.45 (9,65)	23.12 (10,40)	24.95 (11,23)	26.45 (11,90)	28.12 (12,65)	29.79 (13,41)	31.45 (14,15)	27.29 (12,28)
		600 lb	22.30 (10,04)	23.94 (10,77)	25.61 (11,52)	27.44 (12,35)	28.94 (13,02)	30.61 (13,77)	32.28 (14,53)	33.94 (15,27)	29.78 (13,40)
		900 lb	33.13 (14,91)	34.83 (15,67)	36.50 (16,53)	38.17 (17,18)	39.84 (17,93)	41.51 (18,68)	43.15 (19,42)	44.85 (20,18)	47.58 (21,41)
		1500 lb	47.75 (21,49)	49.45 (22,25)	51.12 (23,00)	52.79 (23,76)	54.46 (24,51)	56.13 (25,26)	57.76 (25,99)	59.46 (26,76)	62.20 (27,99)
		2500 lb	83.33 (37,50)	85.03 (38,26)	86.70 (39,02)	88.37 (39,77)	90.04 (40,52)	91.71 (41,27)	93.35 (42,01)	95.05 (42,77)	97.78 (44,00)

Table 3-10. EFW Extended Flanged Seal Weights (lb [kg])

	Pipe size	Class	Extension length								
			1-in. (25 mm)	2-in. (51 mm)	3-in. (76 mm)	4-in. (102 mm)	5-in. (127 mm)	6-in. (152 mm)	7-in. (178 mm)	8-in. (203 mm)	9-in. (229 mm)
ANSI/ASME	4-in.	150 lb	28.61 (12,87)	39.17 (17,63)	49.62 (22,33)	60.07 (27,03)	70.52 (31,73)	80.94 (36,42)	91.42 (41,14)	101.88 (45,85)	31.74 (14,28)
		300 lb	38.62 (17,38)	49.18 (22,13)	59.63 (26,83)	70.08 (31,54)	80.54 (36,24)	90.96 (40,93)	101.44 (45,65)	111.89 (50,35)	41.75 (18,79)
		600 lb	48.37 (21,77)	58.93 (26,52)	69.38 (31,22)	79.83 (35,92)	90.28 (40,63)	100.70 (45,32)	111.19 (50,04)	121.64 (54,74)	51.50 (23,18)
		900 lb	55.27 (24,87)	58.50 (26,33)	61.73 (27,78)	64.96 (29,23)	67.31 (30,29)	70.34 (31,65)	73.36 (33,01)	76.38 (34,37)	80.30 (36,14)
		1500 lb	72.28 (32,53)	75.51 (33,98)	78.74 (35,43)	81.97 (36,89)	84.33 (37,95)	87.35 (39,31)	90.37 (40,67)	93.39 (42,03)	97.31 (43,79)
		2500 lb	126.52 (56,93)	129.75 (58,39)	132.98 (59,84)	136.20 (61,29)	138.57 (62,36)	141.59 (63,72)	144.61 (65,07)	147.63 (66,43)	151.55 (68,20)
	4-in. headbox	150 lb	22.84 (10,28)	25.85 (11,63)	28.90 (13,01)	31.99 (14,40)	35.00 (15,75)	38.06 (17,13)	41.11 (18,50)	44.13 (19,86)	32.00 (14,40)
		300 lb	32.85 (14,78)	35.87 (16,14)	38.92 (17,51)	42.00 (18,90)	45.02 (20,26)	48.07 (21,63)	51.12 (23,00)	54.14 (24,36)	42.02 (18,91)
		600 lb	42.60 (19,17)	45.62 (20,53)	48.67 (21,90)	51.75 (23,29)	54.77 (24,65)	57.82 (26,02)	60.87 (27,39)	63.89 (28,75)	51.77 (23,30)
		900 lb	55.24 (24,86)	58.32 (26,24)	61.37 (27,62)	64.41 (28,98)	67.47 (30,36)	70.52 (31,73)	73.57 (33,11)	76.62 (34,48)	80.74 (36,33)
		1500 lb	72.25 (32,51)	75.33 (33,90)	78.38 (35,27)	81.43 (36,64)	84.48 (38,02)	87.53 (39,39)	90.58 (40,76)	93.63 (42,13)	97.75 (43,99)
		2500 lb	126.49 (56,92)	129.57 (58,31)	132.62 (59,68)	135.67 (61,05)	138.72 (62,42)	141.78 (63,80)	144.83 (65,17)	147.88 (66,55)	152.00 (68,4)
EN 1092 -1	DN 40	PN 40	7.46 (3,36)	7.92 (3,56)	8.38 (3,77)	8.85 (3,98)	9.31 (4,19)	9.77 (4,40)	10.24 (4,61)	10.70 (4,82)	9.39 (4,23)
		PN 63/ 100	11.52 (5,18)	11.98 (5,39)	12.44 (5,60)	12.91 (5,81)	13.37 (6,23)	13.84 (6,34)	14.30 (6,44)	14.76 (6,64)	13.45 (6,05)
		PN 160	13.17 (5,93)	13.63 (6,13)	14.10 (6,35)	14.56 (6,55)	15.03 (6,76)	15.49 (6,97)	15.95 (7,18)	16.42 (7,39)	16.83 (7,57)

Table 3-10. EFW Extended Flanged Seal Weights (lb [kg])

	Pipe size	Class	Extension length									
			1-in. (25 mm)	2-in. (51 mm)	3-in. (76 mm)	4-in. (102 mm)	5-in. (127 mm)	6-in. (152 mm)	7-in. (178 mm)	8-in. (203 mm)	9-in. (229 mm)	
EN 1092 -1	DN 50	PN 40	9.87 (4,44)	10.45 (4,70)	11.06 (5,00)	11.66 (5,25)	12.25 (5,51)	12.84 (5,78)	13.44 (6,05)	14.03 (6,31)	12.81 (5,76)	
		PN 63	13.37 (6,02)	13.96 (6,28)	14.56 (6,55)	15.16 (6,82)	15.75 (7,09)	16.35 (7,36)	16.94 (7,62)	17.54 (7,89)	16.31 (7,34)	
		PN 100	16.05 (7,22)	16.63 (7,48)	17.23 (7,75)	17.83 (8,02)	18.43 (8,29)	19.02 (8,56)	19.61 (8,82)	20.21 (9,09)	18.99 (8,55)	
		PN 160	18.14 (8,16)	18.95 (8,53)	19.76 (8,89)	20.56 (9,25)	21.37 (9,62)	22.18 (9,98)	22.98 (10,34)	23.79 (10,71)	23.96 (10,78)	
	DN 80	Schedule 40	PN 40	16.85 (7,58)	18.47 (8,31)	20.08 (9,04)	21.70 (9,77)	23.32 (10,49)	24.94 (11,22)	26.56 (11,95)	28.18 (12,68)	23.97 (10,79)
			PN 63	20.70 (9,32)	22.32 (10,04)	23.93 (10,77)	25.55 (11,50)	27.17 (12,23)	28.79 (12,96)	30.41 (13,68)	32.03 (14,41)	27.82 (12,52)
			PN 100	25.29 (11,38)	26.90 (12,11)	28.51 (12,83)	30.13 (13,56)	31.75 (14,29)	33.37 (15,02)	34.99 (15,75)	36.61 (16,47)	32.40 (14,58)
			PN 160	29.45 (13,25)	31.10 (14,00)	32.72 (14,72)	34.33 (15,45)	35.95 (16,18)	37.57 (16,91)	39.17 (17,64)	40.81 (18,36)	43.50 (19,58)
		Schedule 80	PN 40	16.53 (7,44)	17.76 (7,99)	19.07 (8,58)	20.36 (9,16)	21.65 (9,74)	22.93 (10,32)	24.22 (10,90)	25.51 (11,48)	21.12 (9,50)
			PN 63	20.38 (9,17)	21.61 (9,72)	22.92 (10,31)	24.21 (10,89)	25.50 (11,48)	26.78 (12,05)	28.07 (12,63)	29.36 (13,21)	24.97 (11,24)
			PN 100	24.97 (11,24)	26.20 (11,79)	27.51 (12,38)	28.79 (12,96)	30.08 (13,54)	31.37 (14,12)	32.65 (14,69)	33.94 (15,27)	29.56 (13,30)
			PN160	29.17 (13,13)	30.67 (13,80)	32.17 (14,48)	33.67 (15,15)	35.17 (15,83)	36.66 (16,50)	38.16 (17,17)	39.66 (17,85)	40.51 (18,23)
		Headbox	PN 40	16.92 (7,61)	18.56 (8,35)	20.23 (9,10)	22.06 (9,93)	23.56 (10,60)	25.23 (11,35)	26.90 (12,11)	28.56 (12,85)	24.40 (10,98)
			PN 63	20.77 (9,35)	22.41 (10,08)	24.08 (10,84)	25.91 (11,66)	27.41 (12,33)	29.08 (13,09)	30.75 (13,84)	32.41 (14,58)	28.25 (12,71)
			PN 100	25.35 (11,41)	26.99 (12,15)	28.66 (12,90)	30.49 (13,72)	31.99 (14,40)	33.66 (15,15)	35.33 (15,90)	37.00 (16,65)	32.84 (14,78)
			PN 160	29.49 (13,27)	31.19 (14,04)	32.86 (14,79)	34.53 (15,54)	36.20 (16,29)	37.87 (17,04)	39.50 (17,78)	41.20 (18,54)	43.94 (19,77)

Table 3-10. EFW Extended Flanged Seal Weights (lb [kg])

	Pipe size	Class	Extension length									
			1-in. (25 mm)	2-in. (51 mm)	3-in. (76 mm)	4-in. (102 mm)	5-in. (127 mm)	6-in. (152 mm)	7-in. (178 mm)	8-in. (203 mm)	9-in. (229 mm)	
EN 1092 -1	DN 100	Schedule 40	PN 10/16	19.23 (8,65)	22.07 (9,93)	24.95 (11,23)	27.85 (12,53)	30.73 (13,83)	33.62 (15,13)	36.50 (16,43)	39.39 (17,73)	29.81 (13,41)
			PN 40	23.32 (10,50)	26.16 (11,77)	29.05 (13,07)	31.94 (14,37)	34.83 (15,67)	37.71 (16,97)	40.60 (18,27)	43.48 (19,57)	33.90 (15,26)
			PN 63	29.83 (13,42)	32.67 (14,70)	35.56 (16,00)	38.45 (17,30)	41.34 (18,60)	44.22 (19,90)	47.11 (21,20)	50.00 (22,50)	40.41 (18,18)
			PN 100	37.37 (16,82)	40.21 (18,09)	43.10 (19,40)	45.99 (20,70)	48.88 (22,00)	51.76 (23,29)	54.65 (24,59)	57.53 (25,89)	47.95 (21,58)
			PN 160	42.48 (19,12)	45.4 (20,43)	48.29 (21,73)	51.17 (23,03)	54.05 (24,32)	56.94 (25,62)	59.82 (26,92)	52.71 (28,22)	66.63 (29,98)
		Schedule 80	PN 16	18.85 (8,48)	21.43 (9,64)	23.98 (10,79)	26.53 (11,94)	29.08 (13,09)	31.66 (14,25)	34.17 (15,38)	36.72 (16,52)	26.81 (12,06)
			PN 40	22.95 (10,33)	25.53 (11,49)	28.07 (12,63)	30.62 (13,78)	33.17 (14,93)	35.75 (16,09)	38.27 (17,22)	40.82 (18,37)	30.90 (13,91)
			PN 63	29.46 (13,26)	32.04 (14,42)	34.58 (15,56)	37.13 (16,71)	39.68 (17,86)	42.26 (19,02)	44.78 (20,15)	47.33 (21,30)	37.41 (16,83)
			PN 100	36.99 (16,65)	39.57 (17,81)	42.12 (18,95)	44.67 (20,10)	47.22 (21,25)	49.80 (22,41)	52.32 (23,54)	84.87 (24,69)	44.95 (20,23)
				PN 160	42.18 (18,98)	44.73 (20,13)	47.30 (21,29)	49.85 (22,43)	52.40 (23,58)	54.94 (24,72)	57.49 (25,87)	60.03 (27,01)
	DN 100	Headbox	PN 16	19.38 (8,72)	22.40 (10,08)	25.45 (11,45)	28.53 (12,84)	31.55 (14,20)	34.60 (15,57)	37.65 (16,94)	40.67 (18,30)	28.55 (12,85)
			PN 40	23.48 (10,57)	26.49 (11,92)	29.54 (13,29)	32.63 (14,68)	35.65 (16,04)	38.70 (17,42)	41.75 (18,79)	44.77 (20,15)	32.64 (14,69)
			PN 63	29.99 (13,50)	33.00 (14,85)	36.05 (16,22)	39.14 (17,61)	42.16 (18,97)	45.21 (20,34)	48.26 (21,72)	51.28 (23,08)	39.15 (17,62)
			PN 100	37.52 (16,88)	40.54 (18,24)	43.59 (19,62)	46.68 (21,01)	49.69 (22,36)	52.74 (23,73)	55.80 (25,11)	58.81 (26,46)	46.69 (21,01)
PN 160			42.68 (19,21)	45.76 (20,59)	48.81 (21,96)	51.86 (23,34)	54.91 (24,71)	57.96 (26,08)	61.01 (27,45)	64.06 (28,83)	68.15 (30,67)	

Table 3-10. EFW Extended Flanged Seal Weights (lb [kg])

	Pipe size	Class	Extension length									
			1-in. (25 mm)	2-in. (51 mm)	3-in. (76 mm)	4-in. (102 mm)	5-in. (127 mm)	6-in. (152 mm)	7-in. (178 mm)	8-in. (203 mm)	9-in. (229 mm)	
JIS	40A	10K	6.09 (2,74)	6.55 (2,95)	7.01 (3,15)	7.48 (3,37)	7.94 (3,57)	8.41 (3,78)	8.87 (3,99)	9.33 (4,20)	8.02 (3,61)	
		20K	6.52 (2,93)	6.98 (3,14)	7.45 (3,35)	7.91 (3,56)	8.38 (3,77)	8.84 (3,98)	9,30 (4,19)	9.33 (4,20)	8.02 (3,81)	
		40k	9.64 (4,34)	10.10 (4,55)	10.57 (4,76)	11.03 (4,96)	11.50 (5,18)	11.96 (5,38)	12.43 (5,59)	12.89 (5,80)	11.85 (5,21)	
		50A	10K	7.73 (3,48)	8,31 (3,74)	8,91 (4,01)	9,51 (4,28)	10,11 (4,55)	10,70 (4,82)	11,30 (5,08)	11,89 (5,35)	10,67 (4,80)
			20K	7.91 (3,56)	8,49 (3,82)	9,10 (4,10)	9,70 (4,37)	10,29 (4,63)	10,89 (4,90)	11,48 (5,17)	12,07 (5,43)	10,85 (4,88)
			40K	11.18 (5,03)	11,76 (5,29)	12,37 (5,57)	13,00 (5,85)	13,56 (6,10)	14,16 (6,37)	14,75 (6,64)	15,35 (6,91)	14,12 (6,35)
	80A	Schedule 40	10K	12.41 (5,58)	14.02 (6,31)	15.63 (7,03)	17.25 (7,76)	18.87 (8,49)	20.49 (9,22)	22.11 (9,95)	23.73 (10,68)	19.52 (8,78)
			20K	15.51 (6,98)	17.12 (7,70)	18.73 (8,43)	20.35 (9,16)	21.97 (9,89)	23.59 (10,62)	25.21 (11,34)	26.83 (12,07)	22.62 (10,18)
			40K	21.92 (9,86)	23.53 (10,59)	25.15 (11,32)	26.77 (12,05)	28.39 (12,78)	30.00 (13,50)	31.62 (14,23)	33.24 (14,96)	29.04 (13,07)
		Schedule 80	10K	12.09 (5,44)	13.32 (5,99)	14.63 (6,58)	15.91 (7,16)	17.20 (7,74)	18.49 (8,32)	19.78 (8,90)	21.06 (9,48)	16.68 (7,51)
			20K	15.19 (6,84)	16.42 (7,39)	17.73 (7,98)	19.01 (8,55)	20.30 (9,14)	21.59 (9,72)	22.88 (10,30)	24.16 (10,87)	19.78 (8,90)
			40K	21.60 (9,72)	22.83 (10,27)	24.14 (10,86)	25.43 (11,44)	26.72 (12,02)	28.00 (12,60)	29.29 (13,18)	30.58 (13,76)	26.19 (11,79)
	100A	Schedule 40	10K	17.15 (7,72)	19.99 (9,00)	22.87 (10,29)	25.77 (11,60)	28.65 (12,89)	31.54 (14,19)	34.42 (15,49)	37.31 (16,79)	27.73 (12,48)
			20K	22.16 (9,97)	24.99 (11,25)	27.88 (12,55)	30.78 (13,85)	33.66 (15,15)	36.55 (16,45)	39.43 (17,74)	42.31 (19,04)	32.73 (14,73)
			40K	35.21 (15,84)	38.05 (17,12)	40.94 (18,42)	43.83 (19,72)	46.72 (21,02)	49.60 (22,32)	52.49 (23,62)	55.37 (24,92)	45.79 (20,61)
		Schedule 80	10K	16.77 (7,55)	19.35 (8,71)	21.90 (9,86)	24.45 (11,00)	27.00 (12,15)	29.58 (13,31)	32.09 (14,44)	34.64 (15,59)	24.73 (11,13)
			20K	21.78 (9,80)	24.36 (10,96)	26.91 (12,11)	29.46 (13,26)	32.00 (14,40)	34.59 (15,57)	37.10 (16,70)	39.65 (17,84)	29.73 (13,38)
			40K	34.83 (15,67)	37.41 (16,83)	39.96 (17,98)	42.51 (19,13)	45.06 (20,28)	47.64 (21,44)	50.16 (22,57)	52.71 (23,72)	42.79 (19,26)


3.6.1 Parts required for installation

The parts required to install the EFW extended flanged seal will be defined here. Prior to installation, you will need a standard wrench and a torque wrench.

Inspect bolts to ensure the material is compatible with industry standards per the application such as ASME PCC-1-2010.

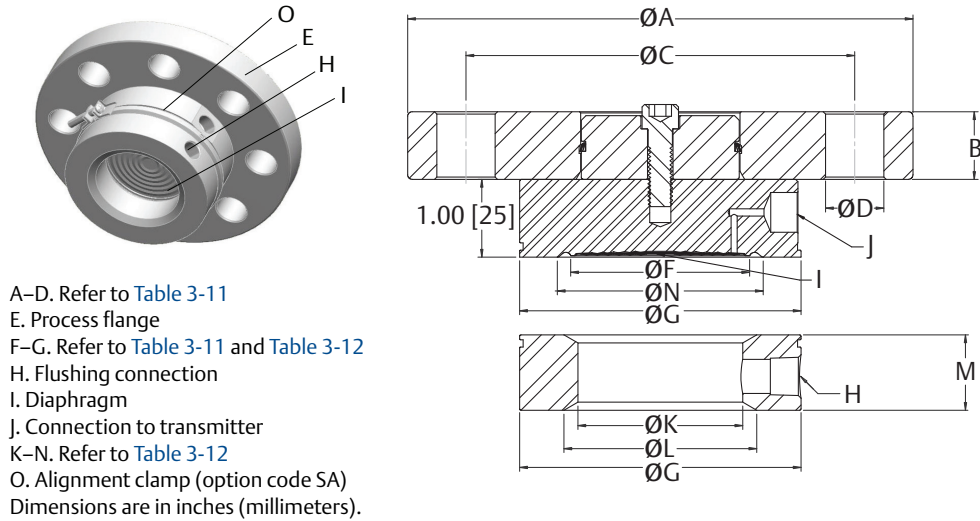
3.6.2 Installation steps

Follow these steps to install the EFW extended flanged seal on an existing process flange. Ensure to use extreme caution during installation to ensure no damage to the seal.

1. Remove the protective sleeve from the diaphragm of the remote seal.
2. Put the washers on the bolts.
3. Insert two bolts in the bottom bolt holes of the flange on the remote seal. Bolts are installed this way to avoid interference with the tank/pipe and to facilitate inspection of bolt material if required.
-  4. Place the appropriate gasket for the application on the remote seal and align the gasket so that it is not contacting the diaphragm as this will induce errors. Failure to properly install the gasket may cause process leaks, which can result in death or serious injury.
5. Using the previously installed bolts, attach the remote seal and gasket to the process connection.
6. Loosely fasten the nuts onto the bolts.
7. Insert two bolts in the top bolt holes of the flange on the remote seal and hand-tighten the nuts.
8. Using a torque wrench on the bolt head and a standard wrench on the nut, tighten the assembly in a cross-pattern to ensure even installation. The bolts should be torqued to the applicable flange requirements. Required torque is a function of the gasket material and surface treatment of the bolts and nuts which are end-user-supplied. For four bolts, the tightening pattern should be 1, 3, 2, 4; for eight bolts, the tightening pattern should be 1, 5, 3, 7, 2, 6, 4, 8; for twelve bolts the tightening pattern should be 1, 9, 5, 3, 11, 7, 2, 10, 6, 4, 12, 8. Tighten 20 to 30 percent, check the gap, tighten 50 to 70 percent, check flange gap and uniformity, and continue to tighten in the appropriate pattern until you reach 100 percent torque value. Time permitting, wait a minimum of four hours and repeat the torque pattern to restore any short term creep/relaxation in the connection. Consider leak checking the installation to ensure a robust connection.

3.7 PFW pancake seal

Figure 3-11. PFW Pancake Seal



Note

The flanged type seals are available with an optional flushing connection ring.

Table 3-11. PFW Pancake Seal Dimensions

	Pipe size	Class	Flange diameter "A" in. (mm)	Flange thickness "B" in. (mm)	Number of bolts	Bolt circle "C" in. (mm)	Bolt hole diameter "D" in. (mm)	Standard diaphragm diameter "F" in. (mm)
ANSI/ASME	2-in.	150 lb	6.00 (152)	0.69 (18)	4	4.75 (121)	0.75 (19)	2.30 (58)
		300 lb	6.50 (165)	0.81 (21)	8	5.00 (127)	0.75 (19)	2.30 (58)
		600 lb	6.50 (165)	1.00 (25)	8	5.00 (127)	0.75 (19)	2.30 (58)
		900/1500 lb	8.50 (216)	1.50 (38)	8	6.50 (165)	1.00 (25)	2.30 (58)
		2500 lb	9.25 (235)	2.00 (51)	8	6.75 (172)	1.13 (29)	2.30 (58)
	3-in.	150 lb	7.50 (191)	0.88 (22)	4	6.00 (152)	0.75 (19)	3.50 (89)
		300 lb	8.25 (210)	1.06 (27)	8	6.62 (168)	0.88 (22)	3.50 (89)
		600 lb	8.25 (210)	1.25 (32)	8	6.62 (168)	0.88 (22)	3.50 (89)
		900 lb	10.50 (267)	1.50 (38)	8	8.00 (203)	1.25 (32)	3.50 (89)
		1500 lb	10.50 (267)	1.88 (48)	8	8.00 (203)	1.25 (32)	3.50 (89)
		2500 lb	12.00 (305)	2.62 (67)	8	9.00 (229)	1.38 (35)	3.50 (89)
	EN1092-1	DN 50	PN 40	6.50 (165)	0.67 (17)	4	4.92 (125)	0.71 (18)
PN 63			7.09 (180)	0.91 (23)	4	5.31 (135)	0.87 (22)	2.30 (58)
PN 100			7.68 (195)	0.98 (25)	4	5.71 (145)	1.10 (28)	2.30 (58)

Table 3-11. PFW Pancake Seal Dimensions

	Pipe size	Class	Flange diameter "A" in. (mm)	Flange thickness "B" in. (mm)	Number of bolts	Bolt circle "C" in. (mm)	Bolt hole diameter "D" in. (mm)	Standard diaphragm diameter "F" in. (mm)
EN1092-1	DN 80	PN 40	7.87 (200)	0.83 (21)	8	6.30 (160)	0.71 (18)	3.50 (89)
		PN 63	8.46 (215)	0.98 (25)	8	6.69 (170)	0.87 (22)	3.50 (89)
		PN 100	9.06 (230)	0.98 (25)	8	7.09 (180)	1.10 (28)	3.50 (89)

Table 3-12. PFW Pancake Seal Dimensions

	Pipe size	Outer diameter "G" in. (mm)	Inner diameter "K" in. (mm)	Beveled diameter "L" in. (mm)	Thickness "M" in. (mm)		Minimum gasket I.D. "N" in. (mm)	Weight lb (kg)
					1/4-in. NPT flush connection	1/2-in. NPT flush connection		
ANSI/ASME	2-in.	3.62 (92)	2.12 (54)	2.48 (63)	0.97 (25)	1.30 (33)	2.5 (64)	8.61 (3,87)
		3.62 (92)	2.12 (54)	2.48 (63)	0.97 (25)	1.30 (33)	2.5 (64)	10.20 (4,59)
		3.62 (92)	2.12 (54)	2.48 (63)	0.97 (25)	1.30 (33)	2.5 (64)	11.65 (5,24)
		3.62 (92)	2.12 (54)	N/A	0.97 (25)	1.30 (33)	2.5 (64)	24.84 (11,18)
		3.62 (92)	2.12 (54)	N/A	0.97 (25)	1.30 (33)	2.5 (64)	36.92 (16,61)
	3-in.	5.00 (127)	3.60 (91)	N/A	0.97 (25)	1.30 (33)	3.7 (94)	16.83 (7,57)
		5.00 (127)	3.60 (91)	N/A	0.97 (25)	1.30 (33)	3.7 (94)	20.88 (9,40)
		5.00 (127)	3.60 (91)	N/A	0.97 (25)	1.30 (33)	3.7 (94)	23.35 (10,51)
		5.00 (127)	3.60 (91)	N/A	0.97 (25)	1.30 (33)	3.7 (94)	33.83 (15,22)
		5.00 (127)	3.60 (91)	N/A	0.97 (25)	1.30 (33)	3.7 (94)	47.39 (19,98)
EN1092-1	DN 50	4.00 (102)	2.40 (61)	N/A	0.97 (25)	1.30 (33)	2.5 (64)	10.67 (4,80)
		4.00 (102)	2.40 (61)	N/A	0.97 (25)	1.30 (33)	2.5 (64)	14.24 (6,41)
		4.00 (102)	2.40 (61)	N/A	0.97 (25)	1.30 (33)	2.5 (64)	16.89 (7,60)
	DN 80	5.43 (138)	3.60 (91)	N/A	0.97 (25)	1.30 (33)	3.7 (94)	18.76 (8,44)
		5.43 (138)	3.60 (91)	N/A	0.97 (25)	1.30 (33)	3.7 (94)	22.60 (10,17)
		5.43 (138)	3.60 (91)	N/A	0.97 (25)	1.30 (33)	3.7 (94)	27.07 (12,18)

3.7.1 Capillary support tube

A common option for the pancake type seal is the 4-in. capillary support tube. Due to the side capillary-to-seal connection, the support tube provides a handle for aligning the pancake seal during installation. The support tube should not be used for supporting any weight.

3.7.2 Process flange

Emerson offers the option of supplying the process flange, otherwise the process flange is furnished by the end-user. For certain pancake seal assemblies, the Emerson-supplied process flange has a machined hole through the center of the flange. This hole corresponds to a threaded connection in the back of the pancake seal upper housing. This allows the flange to be connected to the seal before installation to make handling easier.

3.7.3 Parts required for installation

The parts required to install the PFW pancake seal will be defined here. Prior to installation, you will need a standard wrench, a torque wrench, and a phillips or flathead screwdriver.


Although best practice is to use the same gasket type as is being used to connect the optional flushing ring to the process, the provided gasket may be used once you have verified the Emerson-supplied gasket material is appropriate for the application.

There is a $5/16$ -24 threaded hole on the back of the PFW pancake seal. $21/64$ -in. to $3/8$ -in. through hole could be drilled into your flange to support ease of installation.

Inspect bolts to ensure the material is compatible with industry standards per the application such as ASME PCC-1-2010.

3.7.4 Installation steps

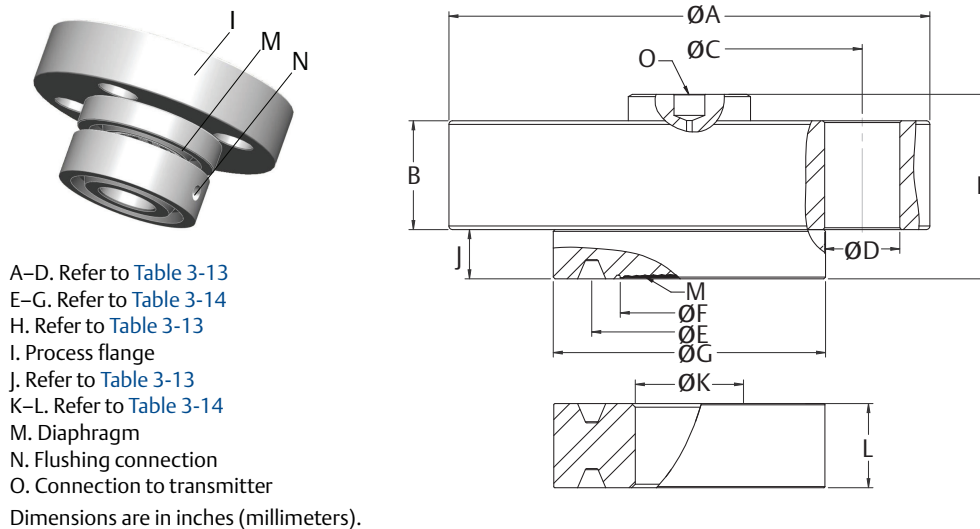
Follow these steps to install the PFW pancake seal on an existing process flange:

1. Remove the plastic cover from the diaphragm of the remote seal.
2. If the Emerson-supplied optional flange was ordered with the PFW pancake seal, the seal and the flange will arrive assembled.
3. If the PFW seal was ordered with both a flushing ring (option codes A, B, 2, H, 6, or V) and an alignment clamp (option code SA); then the alignment clamp should be first used to attach the flushing ring to the seal. Using the alignment clamp, attach the flushing ring to the diaphragm seal with a gasket between the two. The clamp fits in the machined groove on both the remote seal and the flushing ring. Using the applicable screwdriver, tighten the screw on the clamp to hold the flushing ring in place.
4. If a flushing ring was purchased but no alignment clamp, then ensure that a gasket is placed between the diaphragm seal and flushing ring prior to bolting the components to the tank/pipe.
5. Flushing rings may be ordered with none, one, or two threaded connections, or can be supplied by the factory with plugs or drain vent valves. Ensure flushing connections are sealed before completing installation.
6. Put the washers on the bolts.
7. Insert two bolts in the bottom bolt holes of the flange on the remote seal. Bolts are installed this way to avoid interference with the tank/pipe and to facilitate inspection of bolt material if required.
-  8. Place the appropriate gasket for the application on the remote seal or optional flushing ring and align the gasket so that it is not inside the diaphragm weld as this will induce errors. Failure to properly install the gasket may cause process leaks, which can result in death or serious injury.

9. Using the previously installed bolts, attach the remote seal and gasket to the process connection.
10. Loosely fasten the nuts onto the bolts.
11. Insert two bolts in the top bolt holes of the flange on the remote seal and hand-tighten the nuts.
12. Using a torque wrench on the bolt head and a standard wrench on the nut, tighten the assembly in a cross-pattern to ensure even installation. The bolts should be torqued to the applicable flange requirements. Required torque is a function of the gasket material and surface treatment of the bolts and nuts which are end-user-supplied. For four bolts, the tightening pattern should be 1, 3, 2, 4; for eight bolts, the tightening pattern should be 1, 5, 3, 7, 2, 6, 4, 8; for twelve bolts the tightening pattern should be 1, 9, 5, 3, 11, 7, 2, 10, 6, 4, 12, 8. Tighten 20 to 30 percent, check the gap, tighten 50 to 70 percent, check flange gap and uniformity, and continue to tighten in the appropriate pattern until you reach 100 percent torque value. Time permitting, wait a minimum of four hours and repeat the torque pattern to restore any short term creep/relaxation in the connection. Consider leak checking the installation to ensure a robust connection.

3.8 FCW flush flanged seal—ring type joint (RTJ) gasket surface

Figure 3-12. FCW Two-Piece Design (Shown with Flushing Ring)



Note

The flanged type seals are available with an optional flushing connection ring.

Table 3-13. FCW Two-Piece Flange Type Flush Diaphragm Seal Dimensions

	Pipe size	Class	Flange diameter "A" in. (mm)	Flange thickness "B" in. (mm)	Bolt circle diameter "C" in. (mm)	Bolt hole diameter "D" in. (mm)	Overall height "H" in. (mm)	Raised face height "J" in. (mm)
ANSI/ASME	2-in.	150 lb	6.00 (152)	0.69 (18)	4.75 (121)	0.75 (19)	2.43 (62)	0.68 (17)
		300 lb	6.50 (165)	0.82 (21)	5.00 (127)	0.75 (19)	2.43 (62)	0.68 (17)
		600 lb	6.50 (165)	1.00 (25)	5.00 (127)	0.75 (19)	2.43 (62)	0.68 (17)
		1500 lb	8.50 (216)	1.50 (38)	6.50 (165)	1.00 (25)	2.57 (65)	0.82 (21)
		2500 lb	9.25 (235)	2.00 (51)	6.75 (171)	1.14 (29)	3.07 (78)	0.82 (21)
	3-in.	150 lb	7.50 (191)	0.88 (22)	6.00 (152)	0.75 (19)	2.43 (62)	0.68 (17)
		300 lb	8.25 (210)	1.06 (27)	6.62 (168)	0.88 (22)	2.43 (62)	0.68 (17)
		600 lb	8.25 (210)	1.25 (32)	6.62 (168)	0.88 (22)	2.43 (62)	0.68 (17)
		900 lb	9.50 (241)	1.50 (38)	7.50 (191)	1.00 (25)	2.57 (65)	0.82 (21)
		1500 lb	10.50 (267)	1.88 (48)	8.00 (203)	1.25 (32)	3.07 (78)	0.82 (21)
		2500 lb	12.00 (305)	2.62 (67)	9.00 (229)	1.38 (35)	4.07 (103)	0.82 (21)

Table 3-14. FCW Two-Piece Flange Type Flush Connection Dimensions

	Pipe size	RTJ diameter "E" in. (mm)	Diaphragm diameter "F" in. (mm)	Raised face diameter "G" in. (mm)	Inner diameter "K" in. (mm)	Thickness "L" in. (mm)		Weight lb (kg)
						1/4-in. NPT flush connection	1/2-in. NPT flush connection	
ANSI/ASME	2-in.	3.25 (83)	2.30 (58)	4.00 (102)	2.12 (54)	1.40 (36)	1.70 (43)	8.78 (3,95)
		3.25 (83)	2.30 (58)	4.25 (108)	2.12 (54)	1.40 (36)	1.70 (43)	10.56 (4,75)
		3.25 (83)	2.30 (58)	4.25 (108)	2.12 (54)	1.40 (36)	1.70 (43)	12.01 (5,40)
		3.75 (95)	2.30 (58)	4.88 (124)	2.12 (54)	1.40 (36)	1.70 (43)	26.81 (12,06)
		4.00 (102)	3.50 (89)	5.25 (133)	2.12 (54)	1.40 (36)	1.70 (43)	39.98 (17,99)
	3-in.	4.50 (114)	3.50 (89)	5.25 (133)	3.60 (91)	1.50 (38)	1.80 (46)	16.04 (7,22)
		4.88 (124)	3.50 (89)	5.75 (146)	3.60 (91)	1.50 (38)	1.80 (46)	20.72 (9,32)
		4.88 (124)	3.50 (89)	5.75 (146)	3.60 (91)	1.50 (38)	1.80 (46)	23.19 (10,44)
		4.88 (124)	3.50 (89)	6.12 (155)	3.60 (91)	1.50 (38)	1.80 (46)	35.56 (16,00)
		5.38 (137)	3.50 (89)	6.62 (168)	3.60 (91)	1.50 (38)	1.80 (46)	50.72 (22,82)
		5.00 (127)	3.50 (89)	6.62 (168)	3.60 (91)	1.50 (38)	1.80 (46)	86.12 (38,75)

3.8.1 Parts required for installation

The parts required to install the FCW remote flanged seal will be defined here. Prior to installation, you will need a standard wrench and a torque wrench.

Obtain the gasket required to assemble the seal to the process connection according to flange style and rating.


Note

Emerson does not provide this gasket.

Verify the gasket material is appropriate for the application.

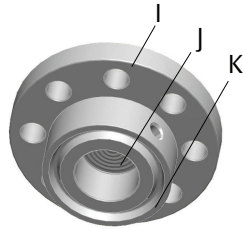
3.8.2 Installation steps

Follow these steps to install the FCW flush flanged seal on an existing process flange:

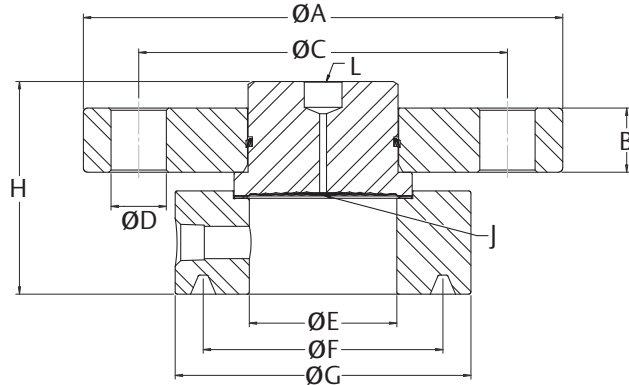
1. Remove the plastic cover from the diaphragm of the remote seal.
2. Flushing rings may be ordered with none, one, or two threaded connections, or can be supplied by the factory with plugs or drain vent valves. Ensure flushing connections are sealed before completing installation.
3. Put the washers on the bolts.
4. Insert two bolts in the bottom bolt holes of the flange on the remote seal. Bolts are installed this way to avoid interference with the tank/pipe and to facilitate inspection of bolt material if required.
-  5. Place the appropriate gasket for the application on the remote seal or optional flushing ring and align the gasket so that it is not contacting the diaphragm as this will induce errors. Failure to properly install the gasket may cause process leaks, which can result in death or serious injury.
6. Using the previously installed bolts, attach the remote seal and gasket to the process connection.
7. Loosely fasten the nuts onto the bolts.
8. Insert two bolts in the top bolt holes of the flange on the remote seal and hand-tighten the nuts.
9. Using a torque wrench on the bolt head and a standard wrench on the nut, tighten the assembly in a cross-pattern to ensure even installation. The bolts should be torqued to the applicable flange requirements. Required torque is a function of the gasket material and surface treatment of the bolts and nuts which are end-user-supplied. For four bolts, the tightening pattern should be 1, 3, 2, 4; for eight bolts, the tightening pattern should be 1, 5, 3, 7, 2, 6, 4, 8; for twelve bolts the tightening pattern should be 1, 9, 5, 3, 11, 7, 2, 10, 6, 4, 12, 8. Tighten 20 to 30 percent, check the gap, tighten 50 to 70 percent, check flange gap and uniformity, and continue to tighten in the appropriate pattern until you reach 100 percent torque value. Time permitting, wait a minimum of four hours and repeat the torque pattern to restore any short term creep/relaxation in the connection. Consider leak checking the installation to ensure a robust connection.

3.9 RCW off-line ring type joint (RTJ) flanged seal

Figure 3-13. RCW Flanged Remote Seal RTJ and Flushing Connection Ring



- A–H. Refer to Table 3-15
- I. Process flange
- J. Diaphragm
- K. Flushing connection
- L. Connection to transmitter



Dimensions are in inches (millimeters).

Note

A lower housing or flushing connection is always required for the RCW type seal.

Table 3-15. RCW Flanged Remote Seal Dimensions

	Pipe size	Class	Flange diameter "A" in. (mm)	Flange thickness "B" in. (mm)	Bolt circle diameter "C" in. (mm)	Bolt hole diameter "D" in. (mm)	Lower housing inner diameter "E" in. (mm)	RTJ groove diameter "F" in. (mm)	Lower housing outer diameter "G" in. (mm)	Overall height "H" in. (mm)		Weight lb (kg)
										No or 1/4-in. NPT flush connection	1/2-in. NPT flush connection	
ANSI/ASME	1/2-in.	2500 lb	5.25 (133)	1.19 (30)	3.50 (89)	0.88 (22)	0.62 (16)	1.69 (43)	2.64 (67)	2.88 (73)	3.18 (81)	1.49 (0,67)
	3/4-in.	300/600 lb	4.62 (117)	0.62 (16)	3.25 (83)	0.75 (19)	0.82 (21)	1.69 (43)	2.64 (67)	2.88 (73)	3.18 (81)	5.22 (2,35)
		900/1500 lb	5.12 (130)	1.00 (25)	3.50 (89)	0.88 (22)	0.82 (21)	1.75 (45)	2.64 (67)	2.88 (73)	3.18 (81)	7.45 (3,35)
	1-in.	2500 lb	5.50 (140)	1.25 (32)	3.75 (95)	0.88 (22)	0.82 (21)	2.00 (51)	2.90 (74)	2.88 (73)	3.18 (81)	10.11 (4,55)
		150 lb	4.25 (108)	0.50 (13)	3.12 (79)	0.63 (16)	1.05 (27)	1.88 (48)	2.64 (67)	2.88 (73)	3.18 (81)	4.38 (1,97)
		300 lb	4.88 (124)	0.62 (16)	3.50 (89)	0.75 (19)	1.05 (27)	2.00 (51)	2.77 (70)	2.88 (73)	3.18 (81)	5.67 (2,55)
		600 lb	4.88 (124)	0.69 (183)	3.50 (89)	0.75 (19)	1.05 (27)	2.00 (51)	2.77 (70)	2.88 (73)	3.18 (81)	5.95 (2,68)
		900/1500 lb	5.88 (149)	1.12 (29)	4.00 (102)	1.00 (25)	1.05 (27)	2.00 (51)	2.83 (72)	2.88 (73)	3.18 (81)	10.15 (4,57)
ANSI/ASME	1 1/2-in.	2500 lb	6.25 (159)	1.38 (35)	4.25 (108)	1.00 (25)	1.05 (27)	2.38 (60)	3.27 (83)	2.88 (73)	3.18 (81)	14.55 (6,55)
		150 lb	5.00 (127)	0.62 (16)	3.88 (98)	0.63 (16)	1.61 (41)	2.56 (65)	3.27 (83)	2.88 (73)	3.18 (81)	6.78 (3,05)
		300 lb	6.12 (156)	0.75 (19)	4.50 (114)	0.88 (22)	1.61 (41)	2.69 (68)	3.58 (91)	2.88 (73)	3.18 (81)	10.01 (4,50)
		600 lb	6.12 (156)	0.88 (22)	4.50 (114)	0.88 (22)	1.61 (41)	2.69 (68)	3.58 (91)	2.88 (73)	3.18 (81)	10.90 (4,91)
		900/1500 lb	7.00 (178)	1.25 (32)	4.88 (124)	1.12 (28)	1.61 (41)	2.69 (68)	3.64 (93)	2.88 (73)	3.18 (81)	16.43 (7,39)
		2500 lb	8.00 (203)	1.75 (45)	5.75 (146)	1.25 (32)	1.61 (41)	3.25 (83)	4.52 (115)	2.88 (73)	3.18 (81)	29.39 (13,23)

3.9.1 4.1-in. (104 mm) diaphragm diameter option

The standard diaphragm size for the RCW seal is 2.4-in. (61 mm). A larger diaphragm option, 4.1-in. (104 mm), is offered which allows the RCW seal more flexibility and reduces temperature error when taking process measurements.

3.9.2 Parts required for installation

The parts required to install the RCW remote flanged seal will be defined here. Prior to installation, you will need a standard wrench and a torque wrench.

Obtain the Emerson-supplied gasket required to assemble the seal to the process connection according to flange style and rating.


Verify the gasket material is appropriate for the application.

Verify the Emerson-supplied gasket material is appropriate for the application.

Inspect bolts to ensure the material is compatible with industry standards per the application such as ASME PCC-1-2010.

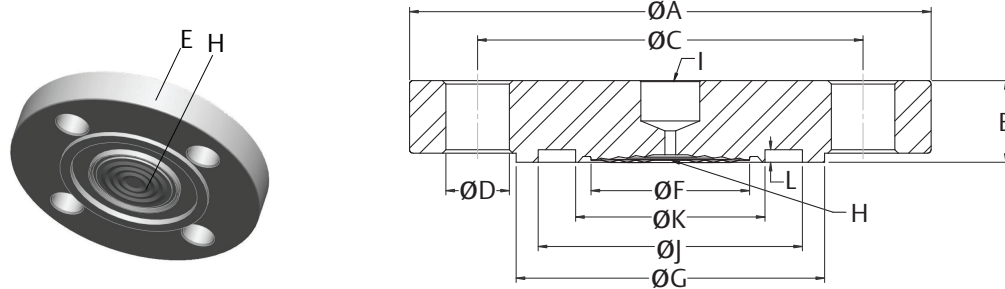
3.9.3 Installation steps

Follow these steps to install the RCW flush flanged seal on an existing process flange:

1. Remove the plastic cover from the diaphragm of the remote seal.
2. Flushing rings may be ordered with none, one, or two threaded connections, or can be supplied by the factory with plugs or drain vent valves. Ensure flushing connections are sealed before completing installation.
3. Put the washers on the bolts.
4. Insert two bolts in the bottom bolt holes of the flange on the remote seal. Bolts are installed this way to avoid interference with the tank/pipe and to facilitate inspection of bolt material if required.
-  5. Place the appropriate gasket for the application on the flushing ring and align the gasket so that it is not contacting the diaphragm as this will induce errors. Failure to properly install the gasket may cause process leaks, which can result in death or serious injury.
6. Using the previously installed bolts, attach the remote seal and gasket to the process connection.
7. Loosely fasten the nuts onto the bolts.
8. Insert two bolts in the top bolt holes of the flange on the remote seal and hand-tighten the nuts.
9. Using a torque wrench on the bolt head and a standard wrench on the nut, tighten the assembly in a cross-pattern to ensure even installation. The bolts should be torqued to the applicable flange requirements. Required torque is a function of the gasket material and surface treatment of the bolts and nuts which are end-user-supplied. For four bolts, the tightening pattern should be 1, 3, 2, 4; for eight bolts, the tightening pattern should be 1, 5, 3, 7, 2, 6, 4, 8; for twelve bolts the tightening pattern should be 1, 9, 5, 3, 11, 7, 2, 10, 6, 4, 12, 8. Tighten 20 to 30 percent, check the gap, tighten 50 to 70 percent, check flange gap and uniformity, and continue to tighten in the appropriate pattern until you reach 100 percent torque value. Time permitting, wait a minimum of four hours and repeat the torque pattern to restore any short term creep/relaxation in the connection. Consider leak checking the installation to ensure a robust connection.

3.10 FUW flush flanged groove type seals

Figure 3-14. FUW Flush Flanged Type Seal—EN1092-1 Type D



A–D. Refer to Table 3-16

E. Process flange

F–G. Refer to Table 3-16

Dimensions are in inches (millimeters).

H. Diaphragm

I. Connection to transmitter

J–L. Refer to Table 3-16

Table 3-16. FUW Flush Flanged Type Seal Dimensions

	Pipe size	Class	Flange diameter "A" in. (mm)	Flange thickness "B" in. (mm)	Bolt circle "C" in. (mm)	Bolt hole diameter "D" in. (mm)	Number of bolts	Standard diaphragm diameter "F" in. (mm)	Raised face diameter "G" in. (mm)	Groove O.D. "J"	Groove I.D. "K"	Groove depth "L"	Weight lb (kg)
EN1092-1	DN 50	PN 40	6.50 (165)	0.79 (20)	4.92 (125)	0.71 (18)	4	2.30 (58)	4.00 (102)	3.46 (88)	2.83 (72)	0.16 (4,00)	6.29 (2,83)
	DN 80	PN 40	7.87 (200)	0.94 (24)	6.30 (160)	0.71 (18)	8	3.50 (89)	5.43 (138)	4.76 (121)	4.13 (105)	0.16 (4,00)	11.29 (5,08)

3.10.1 Parts required for installation

The parts required to install the FUW remote flanged seal will be defined here. Prior to installation, you will need a standard wrench and a torque wrench.

Obtain the gasket required to assemble the seal to the process connection according to flange style and rating.

Verify the gasket material is appropriate for the application.

Note

Emerson does not provide this gasket.

Inspect bolts to ensure the material is compatible with industry standards per the application such as ASME PCC-1-2010.

3.10.2 Installation steps

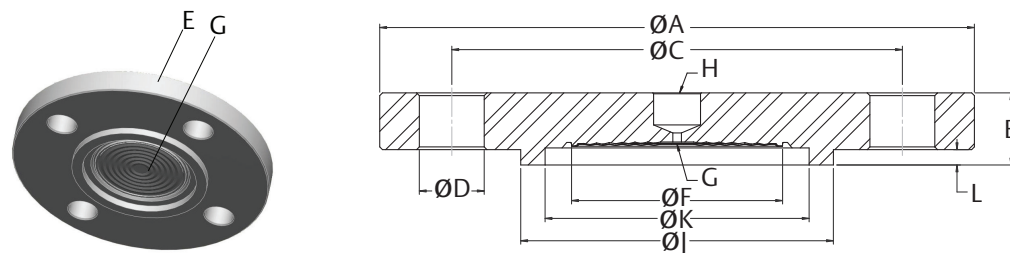
Follow these steps to install the FUW flush flanged seal on an existing process flange:

1. Remove the plastic cover from the diaphragm of the remote seal.
2. Put the washers on the bolts.
3. Insert two bolts in the bottom bolt holes of the flange on the remote seal. Bolts are installed this way to avoid interference with the tank/pipe and to facilitate inspection of bolt material if required.

- ⚠ 4. Place the appropriate gasket for the application on the remote seal and align the gasket so that it is not contacting the diaphragm as this will induce errors. Failure to properly install the gasket may cause process leaks, which can result in death or serious injury.
5. Using the previously installed bolts, attach the remote seal and gasket to the process connection.
6. Loosely fasten the nuts onto the bolts.
7. Insert two bolts in the top bolt holes of the flange on the remote seal and hand-tighten the nuts.
8. Using a torque wrench on the bolt head and a standard wrench on the nut, tighten the assembly in a cross-pattern to ensure even installation. The bolts should be torqued to the applicable flange requirements. Required torque is a function of the gasket material and surface treatment of the bolts and nuts which are end-user-supplied. For four bolts, the tightening pattern should be 1, 3, 2, 4; for eight bolts, the tightening pattern should be 1, 5, 3, 7, 2, 6, 4, 8; for twelve bolts the tightening pattern should be 1, 9, 5, 3, 11, 7, 2, 10, 6, 4, 12, 8. Tighten 20 to 30 percent, check the gap, tighten 50 to 70 percent, check flange gap and uniformity, and continue to tighten in the appropriate pattern until you reach 100 percent torque value. Time permitting, wait a minimum of four hours and repeat the torque pattern to restore any short term creep/relaxation in the connection. Consider leak checking the installation to ensure a robust connection.

3.11 FVW flush flanged tongue type seals

Figure 3-15. FVW Flush Flanged Type Seal—EN1092-1 Type C



A–D. Refer to Table 3-17
E. Process flange
F. Refer to Table 3-17
Dimensions are in inches (millimeters).

G. Diaphragm
H. Connection to transmitter
J–L. Refer to Table 3-17

Table 3-17. FVW Flush Flanged Type Seal Dimensions

	Pipe size	Class	Flange diameter "A" in. (mm)	Flange thickness "B" in. (mm)	Bolt circle "C" in. (mm)	Bolt hole diameter "D" in. (mm)	Number of bolts	Standard diaphragm diameter "F" in. (mm)	Groove O.D. "J" in. (mm)	Tongue I.D. "K" in. (mm)	Tongue depth "L" in. (mm)	Weight lb (kg)
EN1092-1	DN 50	PN 40	6.50 (165)	0.79 (20)	4.92 (125)	0.71 (18)	4	2.30 (58)	3.43(87)	2.87 (73)	0.18 (4,50)	5.52 (2.48)
	DN 80	PN 40	7.87 (200)	0.94 (24)	6.30 (160)	0.71 (18)	8	3.50 (89)	4.72 (120)	4.17 (106)	0.18 (4,50)	10.01 (4,50)

3.11.1 Parts required for installation

The parts required to install the FVW remote flanged seal will be defined here. Prior to installation, you will need a standard wrench and a torque wrench.

Obtain the gasket required to assemble the seal to the process connection according to flange style and rating.

Verify the gasket material is appropriate for the application.


Note

Emerson does not provide this gasket.

Inspect bolts to ensure the material is compatible with industry standards per the application such as ASME PCC-1-2010.

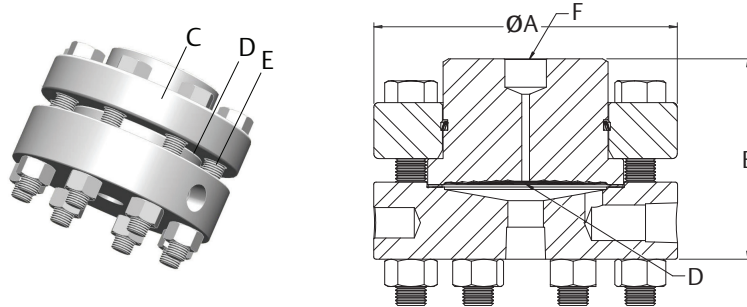
3.11.2 Installation steps

Follow these steps to install the FVW flush flanged seal on an existing process flange:

1. Remove the plastic cover from the diaphragm of the remote seal.
2. Put the washers on the bolts.
3. Insert two bolts in the bottom bolt holes of the flange on the remote seal. Bolts are installed this way to avoid interference with the tank/pipe and to facilitate inspection of bolt material if required.
-  4. Place the appropriate gasket for the application on the remote seal and align the gasket so that it is not contacting the diaphragm as this will induce errors. Failure to properly install the gasket may cause process leaks, which can result in death or serious injury.
5. Using the previously installed bolts, attach the remote seal and gasket to the process connection.
6. Loosely fasten the nuts onto the bolts.
7. Insert two bolts in the top bolt holes of the flange on the remote seal and hand-tighten the nuts.
8. Using a torque wrench on the bolt head and a standard wrench on the nut, tighten the assembly in a cross-pattern to ensure even installation. The bolts should be torqued to the applicable flange requirements. Required torque is a function of the gasket material and surface treatment of the bolts and nuts which are end-user-supplied. For four bolts, the tightening pattern should be 1, 3, 2, 4; for eight bolts, the tightening pattern should be 1, 5, 3, 7, 2, 6, 4, 8; for twelve bolts the tightening pattern should be 1, 9, 5, 3, 11, 7, 2, 10, 6, 4, 12, 8. Tighten 20 to 30 percent, check the gap, tighten 50 to 70 percent, check flange gap and uniformity, and continue to tighten in the appropriate pattern until you reach 100 percent torque value. Time permitting, wait a minimum of four hours and repeat the torque pattern to restore any short term creep/relaxation in the connection. Consider leak checking the installation to ensure a robust connection.

3.12 RTW off-line threaded type seals

Figure 3-16. RTW Threaded Seal



A–B. Refer to Table 3-19

C. Upper housing

D. Diaphragm

Dimensions are in inches (millimeters).

E. Lower housing or flushing connection

F. Connection to transmitter

Note

These are torque values for RTW remote seals.

Table 3-18. RTW Upper Housing Torque Values

Material (nuts and bolts)	Bolt thread size	MWP (psi)	Torque
CS and SST	3/8–24 NF	1500 ⁽¹⁾	23 ft-lb
CS	3/8–24 NF	2500	23 ft-lb
SST	3/8–24 NF	2500	23 ft-lb
CS	3/8–24 NF	5000	53 ft-lb
SST	1/2–20 NF	5000	50 ft-lb
CS	1/2–20 NF	10000	105 ft-lb

1. 1500 psi MWP RTW's are only available on 4.1-in. diaphragm sizes.

This is the specification for connecting the remote seal to the lower housing, not the torque specification for the lower housing onto the process threaded connection. Standard NPT torque values for the size threads in the lower housing should be applied here.

Table 3-19. RTW Lower Housing Dimensions

Rating	Overall diameter "A" in. (mm)	Overall height "B" in. (mm)	
		No or 1/4-in. NPT flush connection	1/2-in. NPT flush connection
2500 psi (173 bar)	3.74 (95)	2.47 (63)	2.82 (72)
5000 psi (345 bar)	3.74 (95)	1.95 (50)	2.31 (59)
10000 psi (690 bar)	4.00 (102)	1.95 (50)	N/A

Table 3-20. RTW Threaded Seal Weights (lb [kg])

	Pipe size	Class						
		1500 psi	2500 psi	5000 psi	10000 psi	103 bar	172 bar	344 bar
ANSI/ASME	1/4-18 NPT	10.73 (4,83)	6.15 (2,77)	5.72 (2,57)	6.95 (3,13)	N/A	N/A	N/A
	3/8-18 NPT	10.72 (4,82)	6.13 (2,76)	5.70 (2,57)	6.93 (3,12)	N/A	N/A	N/A
	1/2-14 NPT	10.67 (4,80)	6.09 (2,74)	5.66 (2,55)	6.89 (3,10)	N/A	N/A	N/A
	3/4-14 NPT	10.62 (4,78)	6.03 (2,71)	5.60 (2,52)	6.83 (3,07)	N/A	N/A	N/A
	1-11.5 NPT	10.52 (4,73)	5.93 (2,67)	5.50 (2,48)	6.73 (3,03)	N/A	N/A	N/A
	1 1/4-11.5 NPT	10.38 (4,67)	5.76 (2,59)	5.33 (2,40)	6.56 (2,95)	N/A	N/A	N/A
	1 1/2-11.5 NPT	10.23 (4,60)	5.61 (2,52)	5.18 (2,33)	6.41 (2,88)	N/A	N/A	N/A
EN 1092-1	Parallel thread: G1/2A DIN 16288	N/A	N/A	N/A	N/A	12.93 (5,82)	7.07 (3,18)	6.64 (3,00)
	Tapered thread: R1/2 per ISO 7/1	N/A	N/A	N/A	N/A	10.67 (4,80)	6.10 (2,75)	5.67 (2,55)

3.12.1 Parts required for installation


The parts required to install the RTW remote threaded seal will be defined here. Prior to installation, you will need a standard wrench, a torque wrench, and thread sealant (thread sealant must meet the requirements of the application. An example thread sealant is PTFE tape).

Verify the Emerson-supplied gasket material is appropriate for the application.

Inspect bolts to ensure the material is compatible with industry standards per the application such as ASME PCC-1-2010.

3.12.2 Installation steps

Follow these steps to install the RTW remote threaded seal on an existing process flange:

1. Ensure the remote seal assembly is disassembled. Remove any bolts holding the upper and lower housings together.
2. Apply the thread tape to the male thread end of the connection. This will be the process connection if using a female threaded lower housing, or the remote seal itself if using a male threaded lower housing.
3. Thread the lower housing to the process connection. The lower housing includes a small hole designed to facilitate this process and to obtain the required torque level.
4. Place the gasket into the groove of the lower housing.
-  5. Place the remote seal on top of the gasket ensuring alignment with the lower housing groove. Failure to properly install the gasket may cause process leaks, which can result in death or serious injury.
6. Install the bolts and hand tighten.

- Using a torque wrench on the bolt head and a standard wrench on the nut, tighten the assembly in a cross-pattern to ensure even installation. The bolts should be torqued to (see [Table 3-18](#) for size and bolt material). The tightening pattern should be 1, 5, 3, 7, 2, 6, 4, 8. Tighten 20 to 30 percent, check the gap, tighten 50 to 70 percent, check flange gap and uniformity, and continue to tighten in the appropriate pattern until you reach 100 percent torque value. Time permitting, wait a minimum of four hours and repeat the torque pattern to restore any short term creep/relaxation in the connection. Consider leak checking the installation to ensure a robust connection.

3.13 HTS male threaded seal

Figure 3-17. HTS Male Threaded Seal

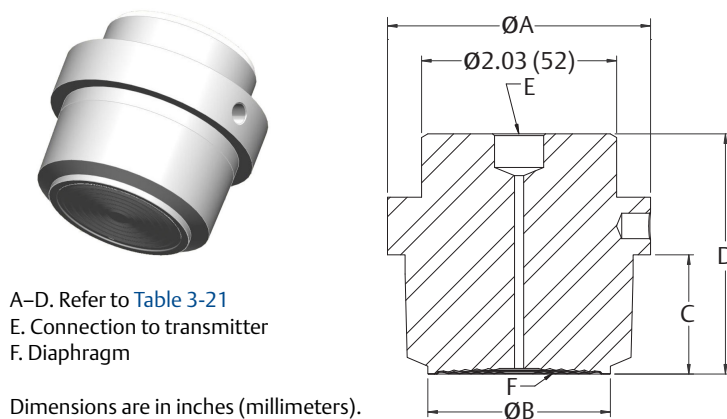


Table 3-21. HTS Male Threaded Seal Dimensions

Process type	Connection size	Outer diameter "A" in. (mm)	Diaphragm diameter "B" in. (mm)	Length "C" in. (mm)	Overall height "D" in. (mm)	Weight lb (kg)
ANSI NPT	1-in. NPT	2.03 (51,6)	1.09 (27,9)	1.24 (31,5)	2.50 (63,5)	1.60 (0,72)
	1 1/2-in. NPT	2.36 (59,9)	1.70 (43,2)	1.24 (31,5)	2.50 (63,5)	2.32 (1,04)
	2-in. NPT	2.74 (69,6)	1.90 (48,3)	1.24 (31,5)	2.50 (63,5)	3.09 (1,39)
ISO 228-1 BSP	G1 BSP	2.03 (51,6)	1.09 (27,9)	0.87 (22,0)	2.15 (54,6)	1.48 (0,67)
	G1 1/2 BSP	2.36 (59,9)	1.70 (43,2)	0.98 (24,9)	2.24 (56,9)	2.10 (0,95)
	G2 BSP	2.74 (69,6)	1.90 (48,3)	1.24 (31,5)	2.50 (63,5)	3.06 (1,38)

3.13.1 Parts required for installation

The parts required to install the HTS remote threaded seal will be defined here. Prior to installation, you will need a torque wrench and thread sealant (thread sealant must meet the requirements of the application. An example thread sealant is PTFE tape).

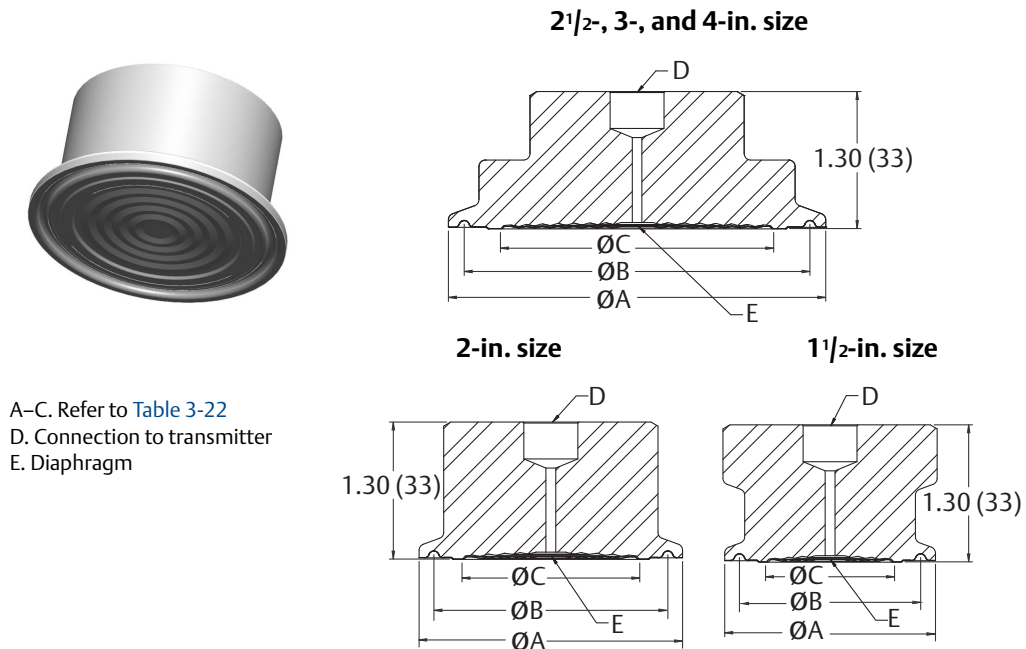
3.13.2 Installation steps

Follow these steps to install the HTS remote threaded seal on an existing process flange:

1. Remove the plastic cover from the diaphragm of the remote seal.
2. Apply the thread sealant to the male thread.
3. Thread the remote seal onto the process connection. When threading the housing to the process pipe, care should be taken not to overtighten. The applied torque should comply with ANSI B1.20.1 for NPT connections or applicable torque requirements for pipe connections.

3.14 SCW hygienic Tri-Clover Tri Clamp seals

Figure 3-18. SCW Tri Clamp Seal



Dimensions are in inches (millimeters).

Table 3-22. SCW Tri Clamp Seal Dimensions

Pipe size	Outer diameter "A" in. (mm)	O-ring groove diameter "B" in. (mm)	Diaphragm diameter "C" in. (mm)	Weight lb (kg)
1 1/2-in.	2.00 (51)	1.72 (44)	1.21 (31)	0.97 (0,44)
2-in.	2.50 (64)	2.22 (56)	1.68 (43)	1.23 (0,55)
2 1/2-in.	3.05 (77)	2.78 (71)	2.07 (53)	1.56 (0,70)
3-in.	3.58 (91)	3.28 (83)	2.58 (66)	1.98 (0,89)
4-in.	4.68 (119)	4.35 (110)	3.66 (93)	3.02 (1,36)

3.14.1 Clamp and gasket

The clamp and gasket are furnished by the user. Maximum pressure rating of the system is dependent upon the clamp pressure rating.

Table 3-23. High Pressure Tri Clamp Maximum Working Pressure

Process connection size	70 °F (21 °C)	250 °F (121 °C)
1½-in.	1,500 psi (103 bar)	1,200 psi (83 bar)
2-in.	1,000 psi (69 bar)	800 psi (55 bar)
2½-in.	1,000 psi (69 bar)	800 psi (55 bar)
3-in.	1,000 psi (69 bar)	800 psi (55 bar)
4-in.	600 psi (41 bar)	500 psi (34 bar)

3.14.2 Parts required for installation

The parts required to install the SCW hygienic Tri Clamp seal will be defined here. Prior to installation, you might need a wrench depending on what the end-user-supplied clamp requires.

Verify the gasket material is appropriate for the application.

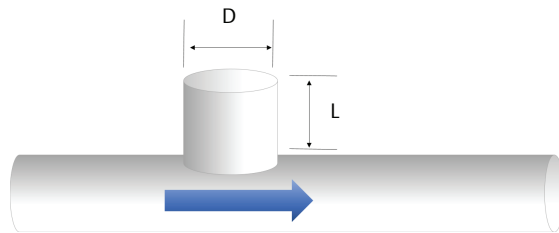
3.14.3 Installation steps

Follow these steps to install the SCW hygienic Tri Clamp seal:

1. Remove the plastic cover from the diaphragm of the remote seal.
- ⚠ 2. Place the appropriate gasket for the application on the remote seal and align the gasket so that it is not contacting the diaphragm as this will induce errors. Failure to properly install the gasket may cause process leaks, which can result in death or serious injury.
3. Ensure that the SCW hygienic Tri Clamp seal is flush with the tank connection.
4. Tighten clamp to manufacturer's specifications.

Note

For T-stub installations. If needing to meet EHEDG requirements; the length (L) divided by the diameter (D) of the tee is to be less than 1. (i.e. $L/D < 1$).



3.15 SSW hygienic tank spud seal

Figure 3-19. SSW Tank Spud Seal

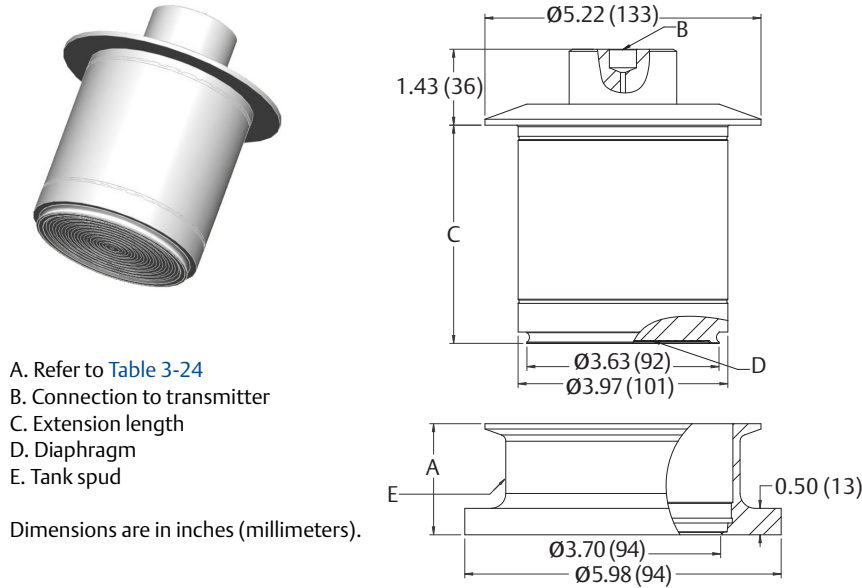


Table 3-24. SSW Tank Spud Seal Dimensions

Pipe size	Extension length	"A" in. (mm)	Weight lb (kg)
4-in. SCH 5	2-in.	2.10 (53)	9.20 (4,14)
	6-in.	6.10 (155)	12.66 (5,70)

3.15.1 Parts required for installation

The parts required to install the SSW hygienic tank spud seal will be defined here. Appropriate cutting and welding equipment will be needed per below instructions.

Verify the O-ring material is appropriate for the application.

To prepare the tank, ensure an area with a minimum diameter of 9¹/₄-in. (235 mm) is available to properly weld the tank spud mount. Cut a hole in the tank, ensuring the hole is as smooth and circular as possible.

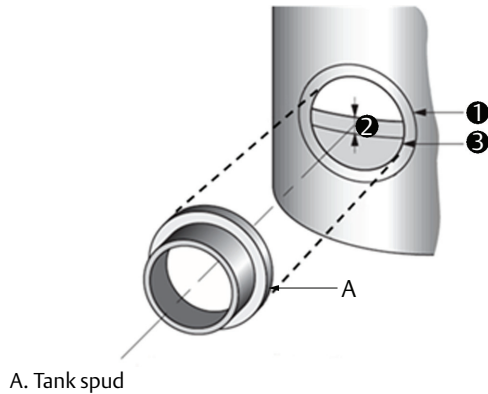
3.15.2 Installation steps

Follow these steps to install the SSW hygienic tank spud seal:

1. Weld the tank spud onto the tank per plant procedures.
2. Remove the plastic cover from the diaphragm of the remote seal.
- ⚠ 3. Place the Emerson-supplied O-ring onto the groove. Failure to properly install the gasket may cause process leaks, which can result in death or serious injury.
4. Insert the SSW hygienic tank spud seal into the tank spud.
5. Attach the Emerson-supplied clamp and hand-tighten the connection.

3.15.3 Tank preparation

Figure 3-20. Tank Preparation

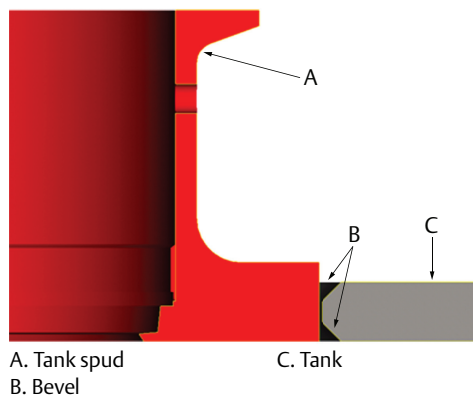


When preparing the tank, ensure an area with a minimum diameter of $9\frac{1}{4}$ -in. (235 mm) is available to properly weld the tank spud, bullet 1 as shown in Figure 3-20. The center of the tank spud should be at least $1\frac{1}{2}$ -in. (38 mm) below the minimum measurement level, bullet 2 as shown in Figure 3-20. In order to get a proper process fluid measurement, half of the remote seal diaphragm must be covered.

Bullet 3 shows the actual hole cut in the tank. Attempt to cut the hole as smoothly and as circular as possible. A torch cut is not recommended. The tank spud O.D. is 5.98-in. \pm 0.010-in. (152 mm \pm 0.25 mm). When cutting the hole for the tank spud, the gap between the hole diameter and spud O.D. should be held to a minimum. It is recommended that the hole be no larger than 6.020-in. (153 mm). Anything larger than 6.020-in. (153 mm) could increase the amount of tank spud distortion.

If a bevel(s) is required, an angle no larger than 37.5° is recommended; see ASME B16.25 for more details. Bevels can be made on one or both sides of the tank. Do not grind or cut the bevel to a sharp point. Attempt to leave a flat area.

Figure 3-21. Bevel Example



The flat area should be large enough to minimize spud distortion but small enough so that tank weld requirements can be met. Minimizing the bevel angle will decrease the amount of fill required during weld and minimize the number of weld passes. These best practices will decrease heat input and help mitigate distortion.

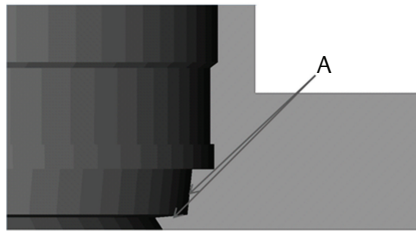
3.15.4 Welding

⚠ CAUTION

Excessive heat will distort the tank spud. Allow adequate cooling time between passes.

Ensure spud is not assembled to transmitter and/or remote seal prior to welding. Do not nick the sealing surfaces of the tank spud, the inner angled surfaces where the O-ring sits shown in [Figure 3-22](#), as any irregularities may cause leaks.

Figure 3-22. O-ring Sealing Surfaces

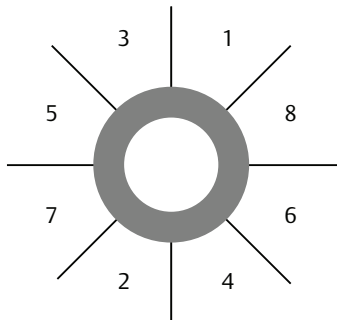


A. Sealing surfaces

With the spud centered in the tank hole, make sure the inner surface of the spud is flush with the inner surface of the tank. The leak detection hole in the spud should be at the bottom of the spud. With the spud properly located, tack weld it into place using four tack welds, 90° from each other.

Begin welding on the inside of vessel. Weld in sections similar to the sequence in [Figure 3-23](#).

Figure 3-23. Welding Sections



Allow time to cool between weld sections. Weld should be cooled to 350 °F (177 °C) or less after each pass while being cool to the touch is preferred. Use of a damp cloth or compressed air is allowed if rapid cooling is desired. Repeat procedure on the outside of the tank.

Note

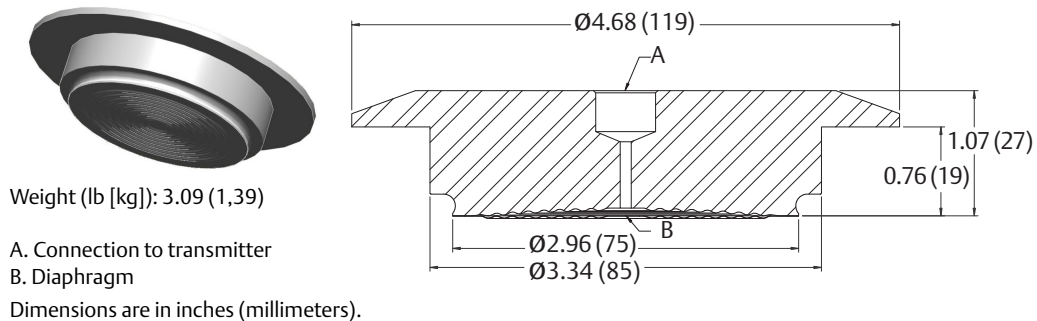
The number of weld passes should be kept to a minimum while maintaining tank weld standards and sanitary requirements. Additional weld passes are a significant contributor to spud distortion due to additional heat input and added filler material in beveled area of hole. When fill passes are required, a 1/16-in. (1.58 mm) diameter weld rod is recommended.

Note

For high pressure clamps up to 1,000 psi (69 bar), contact the factory.

3.16 STW hygienic thin wall tank spud seal

Figure 3-24. STW Hygienic Thin Wall Tank Spud Seal



3.16.1 Parts required for installation

The parts required to install the STW hygienic thin wall seal will be defined here. Prior to installation, you will need the supplied seal and clamp.

Verify the O-ring material is appropriate for the application.

To prepare the tank, ensure an area with a minimum diameter of 9 1/4-in. (235 mm) is available to properly weld the tank spud mount. Cut a hole in the tank, ensuring the hole is as smooth and circular as possible.

Ensure the tank spud is not assembled to the pressure transmitter and/or the remote seal prior to welding.

3.16.2 Installation steps

Follow these steps to install the STW hygienic tank spud seal:

1. Remove the plastic cover from the diaphragm of the remote seal.
- ⚠ 2. Place the Emerson-supplied O-ring onto the groove. Failure to properly install the gasket may cause process leaks, which can result in death or serious injury.
3. Insert the STW hygienic tank spud seal into the tank spud.
4. Attach the Emerson-supplied clamp and hand-tighten the connection.

3.17 EES hygienic flanged tank spud extended seal

Figure 3-25. EES Hygienic Flanged Tank Spud Extended Seal

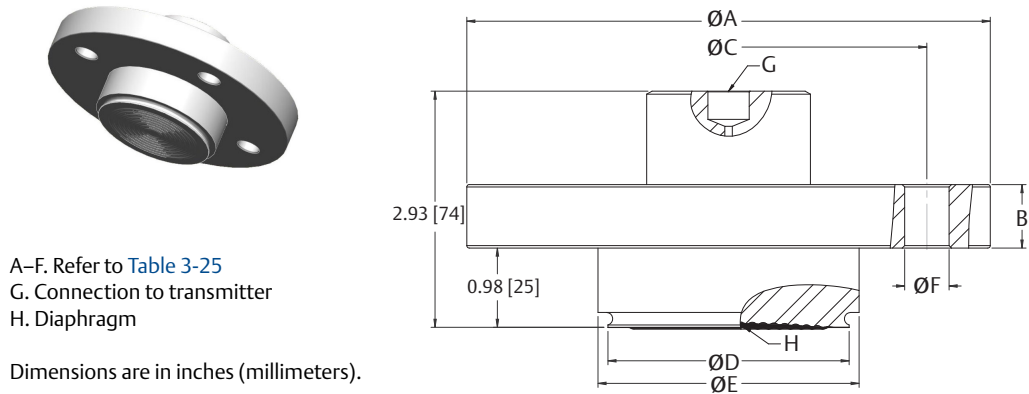


Table 3-25. EES Hygienic Flanged Tank Spud Extended Seal Dimensions

Pipe size	Flange diameter "A" in. (mm)	Flange thickness "B" in. (mm)	Number of bolts	Bolt circle diameter "C" in. (mm)	Standard diaphragm diameter "D" in. (mm)	Extension diameter "E" in. (mm)	Bolt hole diameter "F" in. (mm)	Weight lb (kg)
DN50	6.50 (165)	0.79 (20)	4	4.92 (125)	2.99 (76)	3.24 (82)	0.55 (14)	10.48 (4,72)
DN80	7.87 (200)	0.94 (24)	8	6.30 (160)	4.04 (102)	4.24 (108)	0.55 (14)	17.34 (7,80)

3.17.1 Parts required for installation

The parts required to install the EES hygienic tank spud seal will be defined here. Prior to installation, you will need a wrench and torque wrench.

Verify the gasket material is appropriate for the application.

Ensure the tank spud is not assembled to the pressure transmitter and/or the remote seal prior to welding.

3.17.2 Installation steps

Follow these steps to install the EES hygienic tank spud seal:

1. Weld the tank spud onto the tank per plant procedures.
2. Remove the plastic cover from the diaphragm of the remote seal.
3. Put the washers on the bolts.
4. Insert two bolts in the bottom bolt holes of the flange on the remote seal. Bolts are installed this way to avoid interference with the tank/pipe and to facilitate inspection of bolt material if required.
- ⚠ 5. Place the Emerson-supplied O-ring onto the groove. Failure to properly install the gasket may cause process leaks, which can result in death or serious injury.
6. Insert the EES hygienic tank spud seal into the tank spud.
7. Using the previously installed bolts, attach the remote seal and gasket to the process connection.
8. Loosely fasten the nuts onto the bolts.
9. Insert two bolts in the top bolt holes of the flange on the remote seal and hand-tighten the nuts.

- Using a torque wrench on the bolt head and a standard wrench on the nut, tighten the assembly in a cross-pattern to ensure even installation. The bolts should be torqued to the applicable flange requirements. Required torque is a function of the gasket material and surface treatment of the bolts and nuts which are end-user-supplied. For four bolts, the tightening pattern should be 1, 3, 2, 4; for eight bolts, the tightening pattern should be 1, 5, 3, 7, 2, 6, 4, 8; Tighten 20 to 30 percent, check the gap, tighten 50 to 70 percent, check flange gap and uniformity, and continue to tighten in the appropriate pattern until you reach 100 percent torque value. Time permitting, wait a minimum of four hours and repeat the torque pattern to restore any short term creep/relaxation in the connection. Consider leak checking the installation to ensure a robust connection.

3.18 VCS Tri Clamp In-line seal

Figure 3-26. VCS Tri Clamp In-line Seal

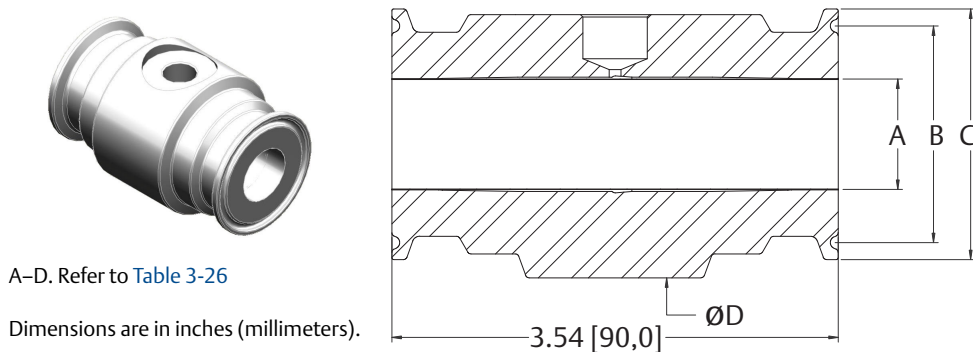


Table 3-26. VCS Tri Clamp In-line Seal Dimensions

Pipe size	Inner diameter "A" in. (mm)	Groove diameter "B" in. (mm)	Flange diameter "C" in. (mm)	Outer diameter "D" in. (mm)	Weight lb (kg)
1-in.	0.87 (22)	1.72 (44)	1.99 (51)	2.33 (59)	2.67 (1,20)
1½-in.	1.37 (35)	1.72 (44)	1.99 (51)	2.73 (69)	2.69 (1,21)
2-in.	1.87 (48)	2.22 (56)	2.52 (64)	3.19 (81)	3.43 (1,54)
3-in.	2.87 (73)	3.28 (83)	3.58 (91)	4.14 (105)	4.76 (2,14)
4-in.	3.82 (97)	4.35 (110)	4.69 (119)	5.06 (129)	6.24 (2,81)


3.18.1 Parts required for installation

The parts required to install the VCS hygienic Tri Clamp seal will be defined here. Prior to installation, you might need a wrench depending on what the end-user-supplied clamp requires.

Verify the gasket material is appropriate for the application. Ensure to use an EHEDG approved gasket if EHEDG conformance is needed.

3.18.2 Installation steps

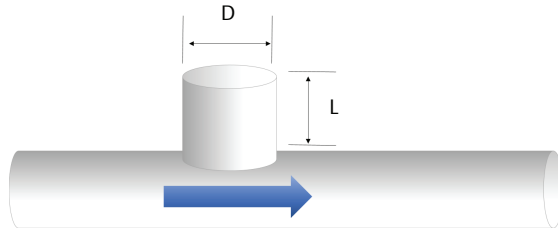
Follow these steps to install the VCS hygienic Tri Clamp seal:

-  Place the appropriate end-user-supplied gasket for the application on the remote seal and align the gasket so that it is not contacting the diaphragm as this will induce errors. Failure to properly install the gasket may cause process leaks, which can result in death or serious injury.

2. Align one end of the VCS hygienic Tri Clamp seal flush with the process piping.
3. Attach the clamp and hand-tighten the connection (wrench might be required depending on clamp style).
- ⚠ 4. Place the second appropriate end-user-supplied gasket for the application on the remote seal and align the gasket so that it is not contacting the diaphragm as this will induce errors. Failure to properly install the gasket may cause process leaks, which can result in death or serious injury.
5. Align the other end of the VCS hygienic Tri Clamp seal with the process piping.
6. Attach the clamp and hand-tighten the connection (wrench might be required depending on clamp style).

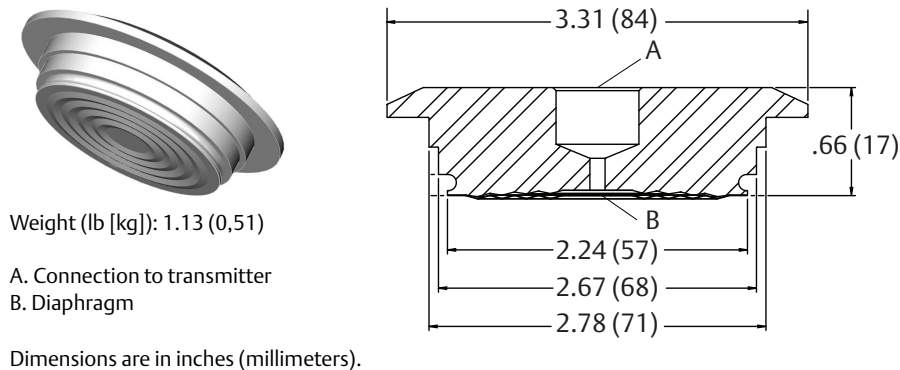
Note

For T-stub installations. If needing to meet EHEDG requirements; the length (L) divided by the diameter (D) of the tee is to be less than 1. (i.e. $L/D < 1$).



3.19 SVS VARIVENT compatible hygienic connection seal

Figure 3-27. SVS VARIVENT Compatible Connection Seal



3.19.1 Parts required for installation

The parts required to install the SVS VARIVENT® seal will be defined here. Prior to installation, you might need a wrench depending on what the end-user-supplied clamp requires.

Verify the gasket material is appropriate for the application. Ensure to use an EHEDG approved gasket if EHEDG conformance is needed.

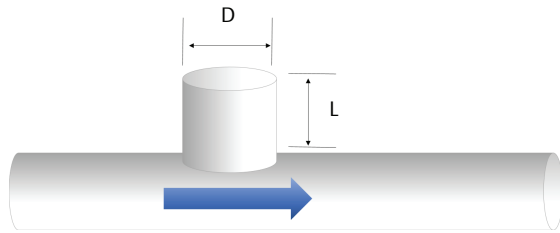
3.19.2 Installation steps

Follow these steps to install the VCS hygienic Tri Clamp seal:

1. Remove the plastic cover from the diaphragm of the remote seal.
- ⚠ 2. Place the appropriate end-user-supplied gasket for the application on the remote seal and align the gasket so that it is not contacting the diaphragm as this will induce errors. Failure to properly install the gasket may cause process leaks, which can result in death or serious injury.
3. Ensure the SVS seal is flush with the tank connection.
4. Attach the clamp and hand-tighten the connection (wrench might be required depending on clamp style).

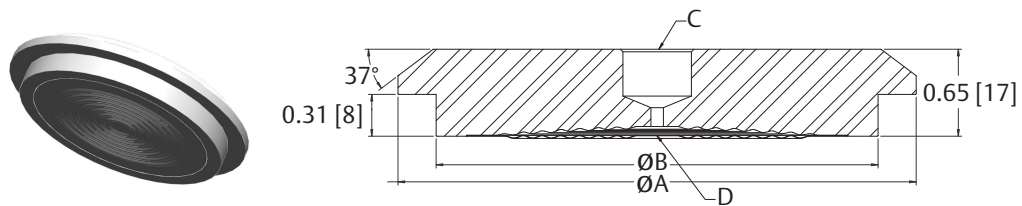
Note

For T-stub installations. If needing to meet EHEDG requirements; the length (L) divided by the diameter (D) of the tee is to be less than 1. (i.e. $L/D < 1$).



3.20 SHP hygienic Cherry-Burrell “I” line seal

Figure 3-28. SHP Cherry-Burrell “I” Line Seal



A–B. Refer to Table 3-27
C. Connection to transmitter
D. Diaphragm

Dimensions are in inches (millimeters).

Table 3-27. SHP Cherry-Burrell “I” Line Seal Dimensions

Size	Outer diameter “A” in. (mm)	Extension diameter “B” in. (mm)	Weight lb (kg)
2-in.	2.64 (67)	2.24 (57)	0.74 (0,33)
3-in.	3.88 (98)	3.31 (84)	1.76 (0,79)

3.20.1 Parts required for installation

The parts required to install the SHP hygienic Cherry-Burrell® seal will be defined here. Prior to installation, you might need a wrench depending on what the end-user-supplied clamp requires.

Verify the gasket material is appropriate for the application.

3.20.2 Installation steps

Follow these steps to install the SHP seal:

1. Remove the plastic cover from the diaphragm of the remote seal.
- ⚠ 2. Place the end-user-supplied gasket onto the groove of the remote seal. Place the appropriate gasket for the application on the remote seal and align the gasket so that it is not contacting the diaphragm as this will induce errors. Failure to properly install the gasket may cause process leaks, which can result in death or serious injury.
3. Ensure that the SHP seal is flush with the tank connection.
4. Attach the clamp and hand-tighten the connection (wrench might be required depending on clamp style).

3.21 SLS dairy process connection–female thread seal per DIN 11851

Figure 3-29. SLS Hygienic Dairy Process Connection Female Thread Seal per DIN 11851

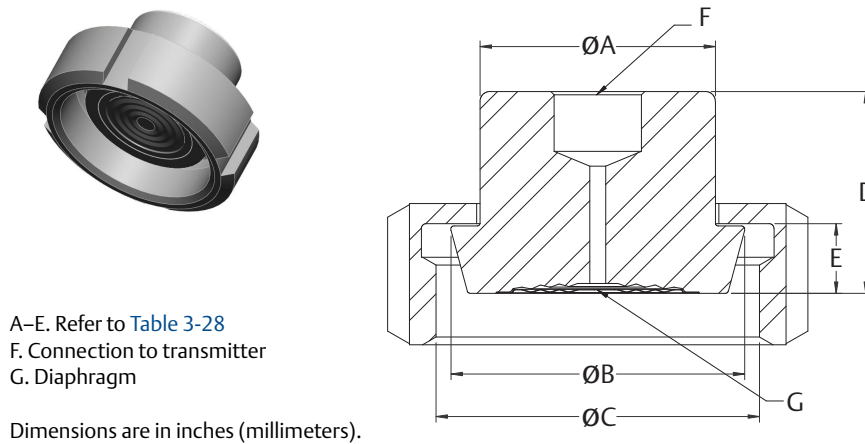


Table 3-28. SLS Hygienic Dairy Process Connection Female Thread Seal per DIN 11851 Dimensions

Female thread	Process size/ rating	Hub diameter “A” in. (mm)	“B” in. (mm)	Thread diameter “C” in. (mm)	Hub height “D” in. (mm)	“E” in. (mm)	Weight lb (kg)
DIN 11851	DN 40 PN 40	1.89 (48)	2.20 (56)	Rd 65 X 1/6-in.	1.18 (30)	0.39 (10)	1.61 (0,72)
	DN 50 PN 25	2.40 (61)	2.70 (69)	Rd 78 X 1/6-in.	1.22 (31)	0.43 (11)	2.32 (1,04)

3.21.1 Parts required for installation

The parts required to install the SLS threaded seal will be defined here. Prior to installation, you will need a wrench.

Note

Verify the gasket material is appropriate for the application. Ensure to use an EHEDG approved gasket if EHEDG conformance is needed.

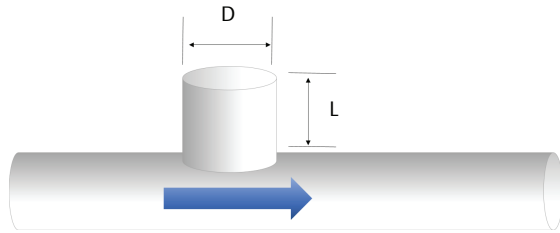
3.21.2 Installation steps

Follow these steps to install the SLS threaded seal on an existing process flange:

1. Remove the plastic cover from the diaphragm of the remote seal.
2. Install the SLS seal into the process connection.
3. Tighten the nut onto the process connection per DIN 11851. Care should be taken not to overtighten.

Note

For T-stub installations. If needing to meet EHEDG requirements; the length (L) divided by the diameter (D) of the tee is to be less than 1. (i.e. $L/D < 1$).



3.22 WSP saddle seal

Figure 3-30. WSP Saddle Seal

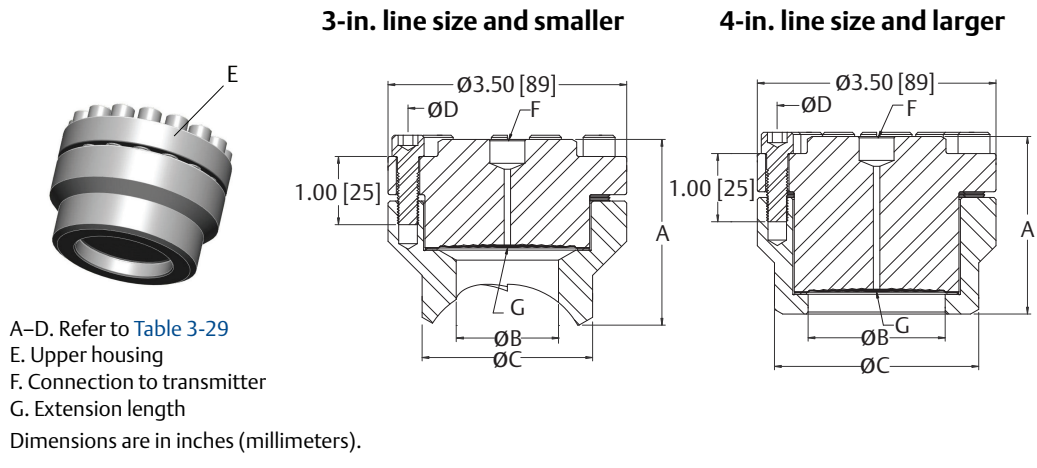


Table 3-29. WSP Saddle Seal Dimensions

Size	Overall height “A” in. (mm)	Inner diameter “B” in. (mm)	Outer diameter “C” in. (mm)	Bolt circle diameter “D” in. (mm)	
				6 bolts	8 bolts
2-in.	2.72 (69)	1.50 (38)	2.50 (64)	2.99 (76)	2.91 (74)
3-in.	2.46 (63)	2.01 (51)	3.02 (77)	2.99 (76)	2.91 (74)
4-in. and larger	2.60 (66)	2.01 (51)	3.00 (76)	2.99 (76)	2.91 (74)

Table 3-30. WSP Saddle Seal Weights

	Pipe size	Class	Weight lb (kg)
ANSI/ASME	2-in.	1250 psig	4.61 (2,09)
		1500 psig	4.63 (2,10)
	3-in.	1250 psig	4.36 (1,98)
		1500 psig	4.38 (1,99)
	4-in.	1250 psig	5.46 (5,48)
		1500 psig	5.60 (2,54)

3.22.1 Parts required for installation

The parts required to install the WSP saddle seal will be defined here. Prior to installation, you will need a torque wrench and appropriate welding supplies.

Verify the gasket material is appropriate for the application.

Ensure the saddle lower is not assembled to the pressure transmitter and/or the remote seal prior to welding.

3.22.2 Installation steps

Follow these steps to install the WSP saddle seal:

1. Weld the saddle lower onto the process pipe or tank per plant procedures. When connecting the lower housing to your process, refer to the applicable welding standard for your application.

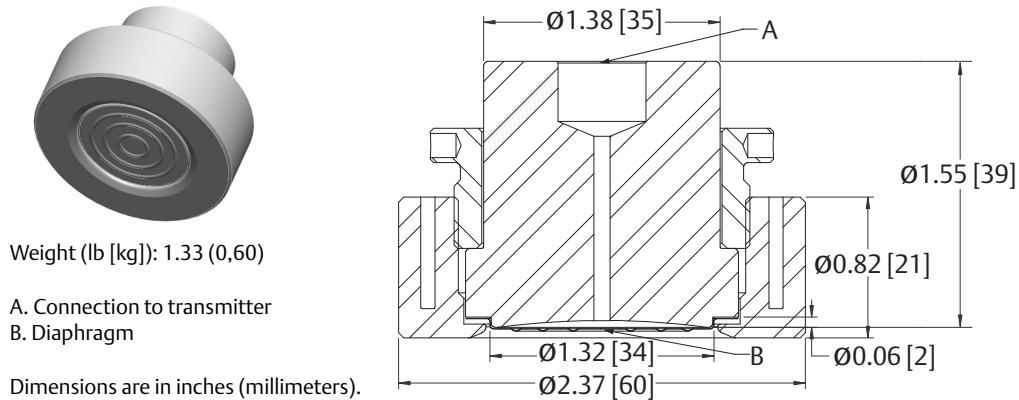
⚠ CAUTION

Excessive heat will distort the saddle lower. Allow adequate cooling time between passes.

2. Remove the plastic cover from the diaphragm of the remote seal.
- ⚠ 3. Place the appropriate gasket for the application into the lower housing and align the gasket so that it is not contacting the diaphragm as this will induce errors. Failure to properly install the gasket may cause process leaks, which can result in death or serious injury.
4. Insert the WSP saddle seal into the lower housing.
5. Loosely thread all bolts into the lower housing.
6. Using a torque wrench tighten the assembly in a cross-pattern to ensure even installation. The bolts should be torqued to 180 in-lb (20 N-m) with stainless or carbon steel bolts. For six bolts, the tightening pattern should be 1, 4, 2, 5, 3, 6; for eight bolts, the tightening pattern should be 1, 5, 3, 7, 2, 6, 4, 8; for twelve bolts the tightening pattern should be 1, 9, 5, 3, 11, 7, 2, 10, 6, 4, 12, 8. Tighten 20 to 30 percent, check the gap, tighten 50 to 70 percent, check gap and uniformity, and continue to tighten in the appropriate pattern until you reach 100 percent torque value. Time permitting, wait a minimum of four hours and repeat the torque pattern to restore any short term creep/relaxation in the connection. Consider leak checking the installation to ensure a robust connection.

3.23 UCP union connection pipe mount seal

Figure 3-31. UCP Threaded Pipe Mount Seal



3.23.1 Parts required for installation

The parts required to install the UCP union connection seal will be defined here. Prior to installation, you will need a torque wrench, hole saw, and appropriate welding supplies.

Verify the gasket material is appropriate for the application.

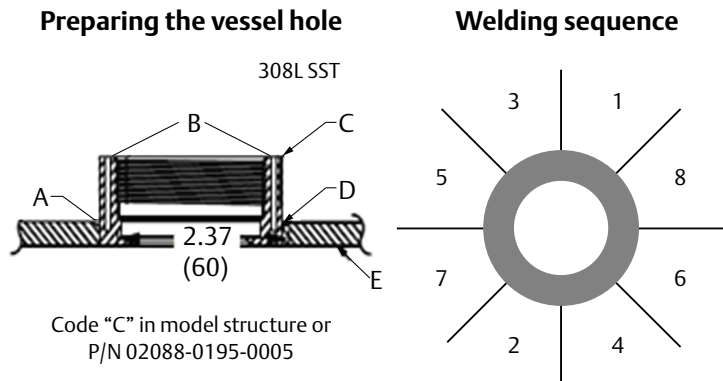
3.23.2 Installation steps

1. Using the appropriate size hole saw, cut a hole in the process vessel to accept the lower housing. The diameter for a lower housing with a heat isolator groove is 2.37-in. (60 mm). The hole should produce a tight, uniform fit when coupled with the lower housing.
2. Bevel the edge of the vessel hole to accept filler material (see [Figure 3-32 on page 70](#)). An angle no larger than 37.5° is recommended; see ASME B16.25 for more details. Bevels can be made on one or both sides of the tank. Do not grind or cut the bevel to a sharp point. Attempt to leave a flat area. The flat area should be large enough to minimize spud distortion but small enough so that tank weld requirements can be met. Minimizing the bevel angle will decrease the amount of fill required during weld and minimize the number of weld passes. These best practices will decrease heat input and help mitigate distortion.
3. Position the lower housing weld spud in the vessel hole, place heat sink and tack the housing in place using the welding sequence shown in [Figure 3-32 on page 70](#). Cool each section with a wet cloth before proceeding to the next section.
4. Do not place the seal in the lower housing prior to welding. Do not nick the sealing surfaces of the weld spud, the inner angled surfaces where the gasket sits shown, as any irregularities may cause leaks.
5. Weld the housing in place using 0.030- to 0.045-in. (0,762 to 1,143 mm) stainless steel rod as filler in the beveled area. Using between 100 and 125 amps, adjust the amperage for 0.080-in. (2,032 mm) penetration. Allow time to cool between weld sections. Weld should be cooled to 350 °F (177 °C) or less after each pass while being cool to the touch is preferred. Use of a damp cloth or compressed air is allowed if rapid cooling is desired. Repeat procedure on the outside of the tank.

Note

The number of weld passes should be kept to a minimum while maintaining tank weld standards and process requirements. Additional weld passes are a significant contributor to spud distortion due to additional heat input and added filler material in beveled area of hole.

Figure 3-32. Installing the Weld Spud



- A. 100–125 Amps recommended
 - B. Heat isolation grooves
 - C. Weld spud
 - D. Bevelled edge
 - E. Process vessel
- Dimensions are in inches (millimeters).

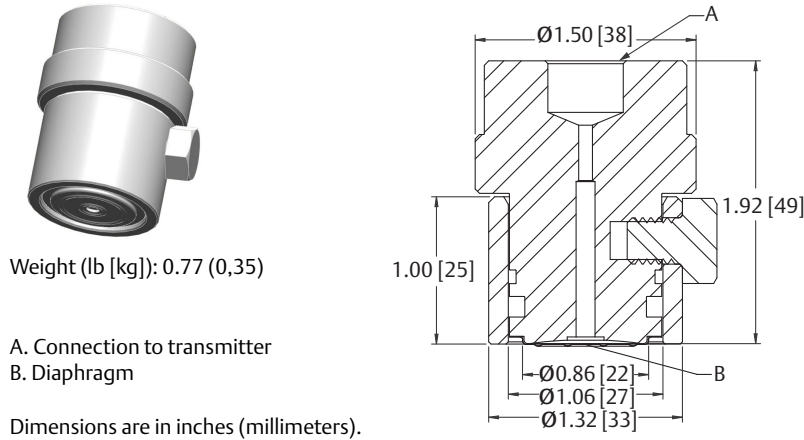
- ⚠ 6. Place the gasket into the lower housing make sure the gasket is properly aligned on the gasket sealing surface. Failure to properly install the gasket may cause process leaks, which can result in death or serious injury.
7. Insert the UCP seal into the lower housing and tighten the jam nut.

⚠ CAUTION

Excessive heat will distort the weld spud. Allow adequate cooling time between passes.

3.24 PMW paper mill sleeve seal

Figure 3-33. PMW Threaded Pipe Mount Seal



3.24.1 Parts required for installation

The parts required to install the PMW paper mill seal will be defined here. Prior to installation, you will need a torque wrench, hole saw, an appropriate welding supplies.

Verify the O-ring material is appropriate for the application.

Ensure the weld spud is not assembled to the pressure transmitter and/or the remote seal prior to welding.

3.24.2 Installation steps

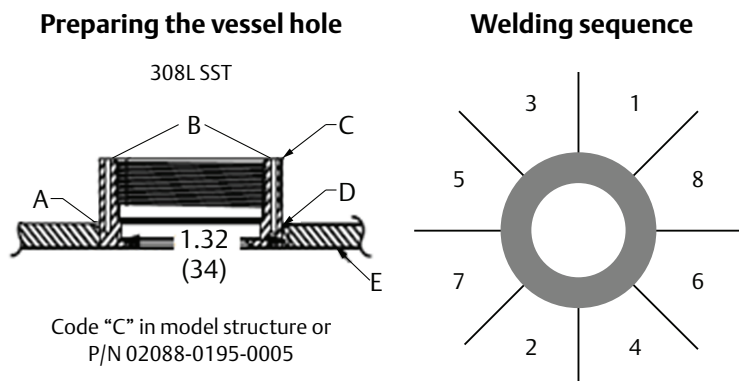
1. Using the appropriate size hole saw, cut a hole in the process vessel to accept the lower housing. The diameter for a lower housing with a heat isolator groove is 1.32-in. (33,4 mm). The hole should produce a tight, uniform fit when coupled with the lower housing.
2. Bevel the edge of the vessel hole to accept filler material (see [Figure 3-34 on page 72](#)). An angle no larger than 37.5° is recommended; see ASME B16.25 for more details. Bevels can be made on one or both sides of the tank. Do not grind or cut the bevel to a sharp point. Attempt to leave a flat area. The flat area should be large enough to minimize spud distortion but small enough so that tank weld requirements can be met. Minimizing the bevel angle will decrease the amount of fill required during weld and minimize the number of weld passes. These best practices will decrease heat input and help mitigate distortion.

3. Position the weld spud in the vessel hole, place heat sink and tack the housing in place using the welding sequence shown in Figure 3-34. Cool each section with a wet cloth before proceeding to the next section.
4. Do not place the seal in the lower housing prior to welding. Do not nick the sealing surfaces of the weld spud, the inner angled surfaces where the gasket sits shown, as any irregularities may cause leaks.
5. Weld the housing in place using 0.030- to 0.045-in. (0,762 to 1,143 mm) stainless steel rod as filler in the beveled area. Using between 100 and 125 amps, adjust the amperage for 0.08- in. (2,032 mm) penetration. Allow time to cool between weld sections. Weld should be cooled to 350 °F (177 °C) or less after each pass while being cool to the touch is preferred. Use of a damp cloth or compressed air is allowed if rapid cooling is desired. Repeat procedure on the outside of the tank.

Note

The number of weld passes should be kept to a minimum while maintaining tank weld standards and process requirements. Additional weld passes are a significant contributor to spud distortion due to additional heat input and added filler material in beveled area of hole.

Figure 3-34. Installing the Weld Spud



- A. 100 to 125 Amps recommended
 - B. Heat isolation grooves
 - C. Weld spud
 - D. Bevelled edge
 - E. Process vessel
- Dimensions are in inches (millimeters).

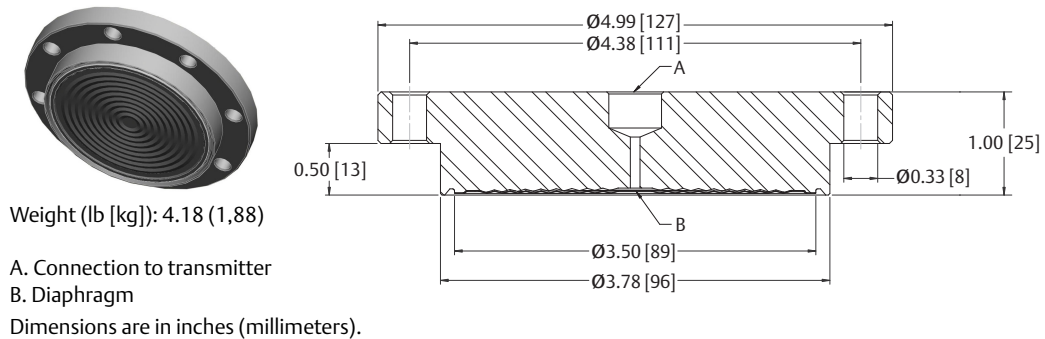
CAUTION

Excessive heat will distort the weld spud. Allow adequate cooling time between passes.

6. If not previously installed, place the O-rings onto the seal body. Failure to properly install the gasket may cause process leaks, which can result in death or serious injury.
7. Insert PMW remote seal into the lower housing.
8. Install capture bolt and torque to 7.5 ft-lb.

3.25 CTW chemical tee seal

Figure 3-35. CTW Chemical Tee Seal



Weight (lb [kg]): 4.18 (1,88)

A. Connection to transmitter

B. Diaphragm

Dimensions are in inches (millimeters).

3.25.1 Parts required for installation

The parts required to install the CTW seal will be defined here. Prior to installation, you will need a standard wrench and a torque wrench.

Obtain the gasket required to assemble the seal to the process connection according to flange style and rating.

Verify the gasket material is appropriate for the application.

Verify the Emerson-supplied gasket material is appropriate for the application.

Inspect bolts to ensure the material is compatible with industry standards per the application such as ASME PCC-1-2010.

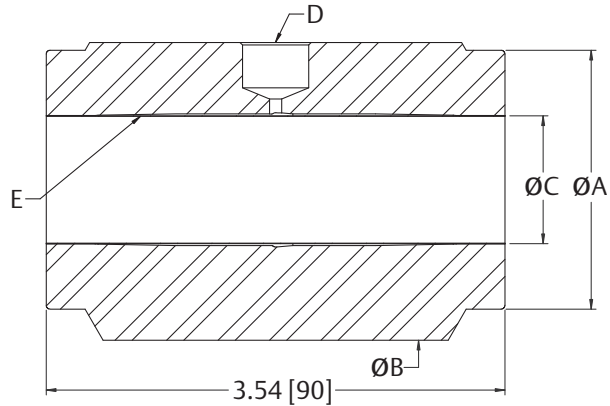
3.25.2 Installation steps

Follow these steps to install the CTW seal on an existing process flange:

1. Remove the plastic cover from the diaphragm of the remote seal.
2. Put the washers on the bolts.
- ⚠ 3. Place the gasket into the lower housing make sure the gasket is properly aligned on the gasket sealing surface. Failure to properly install the gasket may cause process leaks, which can result in death or serious injury.
4. Loosely install bolts.
5. Using a torque wrench on the bolt head and a standard wrench on the nut, tighten the assembly in a cross-pattern to ensure even installation. The bolts should be torqued to the applicable flange requirements. Required torque is a function of the gasket material and surface treatment of the bolts and nuts which are end-user-supplied. For eight bolts, the tightening pattern should be 1, 5, 3, 7, 2, 6, 4, 8. Tighten 20 to 30 percent, check the gap, tighten 50 to 70 percent, check flange gap and uniformity, and continue to tighten in the appropriate pattern until you reach 100 percent torque value. Time permitting, wait a minimum of four hours and repeat the torque pattern to restore any short term creep/relaxation in the connection. Consider leak checking the installation to ensure a robust connection.

3.26 TFS wafer style In-line seal

Figure 3-36. TFS Wafer Style In-Line Seal



A–C. Refer to Table 3-31
D. Connection to transmitter
E. Diaphragm

Dimensions are in inches (millimeters).

Table 3-31. TFS Wafer Style In-line Seal Dimensions

Pipe size	Flange face diameter "A" in. (mm)	Outer diameter "B" in. (mm)	Inner diameter "C" in. (mm)	Weight lb (kg)
1-in.	2.00 (51)	2.64 (67)	1.090 (28)	3.91 (1,76)
1½-in.	2.88 (73)	3.23 (82)	1.61 (41)	5.73 (2,58)
2-in.	3.62 (92)	3.74 (95)	2.07 (52)	7.42 (3,34)
3-in.	5.00 (127)	5.00 (127)	3.07 (78)	12.20 (5,49)
4-in.	6.19 (157)	6.19 (157)	4.00 (102)	17.56 (7,90)
DN25	2.68 (68)	2.72 (69)	1.09 (28)	4.76 (2,14)
DN40	3.46 (88)	3.46 (88)	1.61 (41)	7.35 (3,31)
DN50	4.02 (102)	4.09 (104)	1.99 (51)	9.97 (4,49)
DN80	5.43 (138)	5.47 (139)	3.24 (82)	15.24 (6,86)
DN100	6.38 (162)	6.46 (164)	4.22 (107)	18.69 (8,41)

3.26.1 Parts required for installation

The parts required to install the TFS seal will be defined here. Prior to installation, you will need a standard wrench and a torque wrench.

Obtain the gasket required to assemble the seal to the process connection according to flange style and rating.

Verify the gasket material is appropriate for the application.

3.26.2 Installation steps

Follow these steps to install the TFS seal on an existing process flange:

1. Remove the plastic cover from the diaphragm of the remote seal.
2. Put the washers on the bolts.

3. Using the previously installed bolts, attach the remote seal and gasket to the process connection. Make sure the seal is aligned with the process flanges.
4. Loosely fasten the nuts onto the bolts.
5. Insert two bolts in the top bolt holes of the flanges and hand-tighten the nuts.
6. Using a torque wrench on the bolt head and a standard wrench on the nut, tighten the assembly in a cross-pattern to ensure even installation. The bolts should be torqued to the specifications outlined by ANSI B16.5, EN 1092-1, or JIS B 2210 flange torque requirements. Required torque is a function of the gasket material and surface treatment of the bolts and nuts, which are end-user-supplied. For four bolts, the tightening pattern should be 1, 3, 2, 4; for eight bolts, the tightening pattern should be 1, 5, 3, 7, 2, 6, 4, 8; for twelve bolts the tightening pattern should be 1, 9, 5, 3, 11, 7, 2, 10, 6, 4, 12, 8. Tighten 20 to 30 percent, check the gap, tighten 50 to 70 percent, check flange gap and uniformity, and continue to tighten in the appropriate pattern until you reach 100 percent torque value. Time permitting, wait a minimum of four hours and repeat the torque pattern to restore any short term creep/relaxation in the connection. Consider leak checking the installation to ensure a robust connection.

3.27 WFW flow-thru flanged seal

Figure 3-37. WFW Flow-Thru Flanged Seal

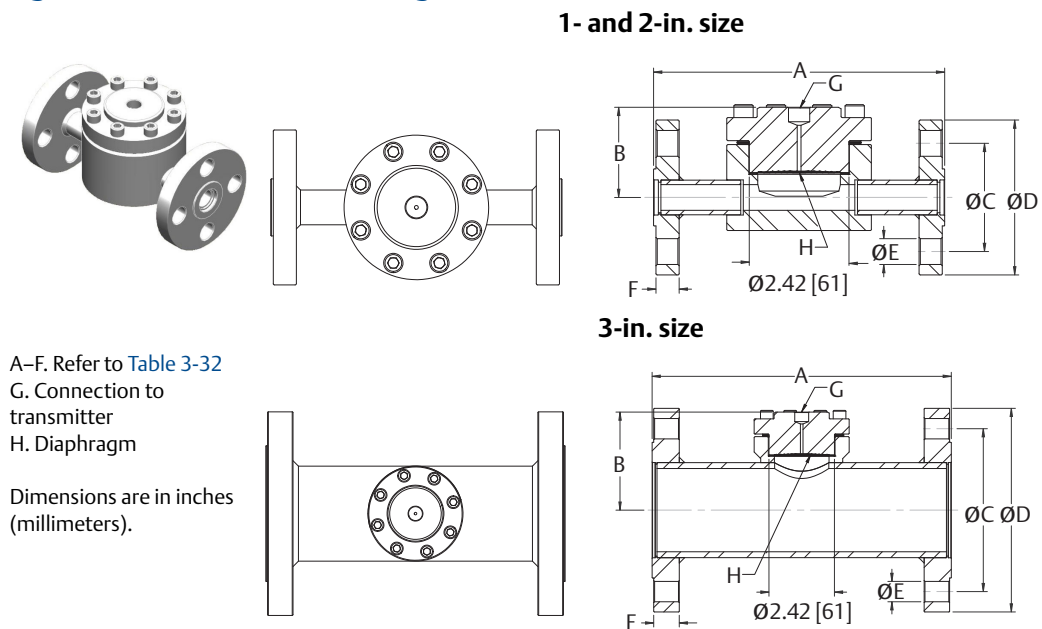


Table 3-32. WFW Flow-Thru Flanged Seal Dimensions

Nominal pipe size	Class	Overall length "A" in. (mm)	Upper to centerline height "B" in. (mm)	Bolt circle diameter "C" in. (mm)	Outside diameter "D" in. (mm)	Bolt hole diameter "E" in. (mm)	Flange thickness "F" in. (mm)	Weight lb (kg)
1-in.	150 lb	7.00 (178)	2.40 (61)	3.12 (79)	4.25 (108)	0.62 (16)	0.50 (13)	11.80 (5,31)
2-in.		9.00 (229)	3.31 (84)	4.75 (121)	6.00 (152)	0.75 (19)	0.69 (18)	23.66 (10,73)
3-in.		11.00 (279)	3.61 (92)	6.00 (152)	7.50 (191)	0.75 (19)	0.88 (22)	29.08 (13,09)

3.27.1 Parts required for installation

The parts required to install the WFW seal will be defined here. Prior to installation, you will need a standard wrench and a torque wrench.

Obtain the gasket required to assemble the seal to the process connection according to flange style and rating.

Verify the gasket material is appropriate for the application.


Verify the Emerson-supplied gasket material is appropriate for the application.

Inspect bolts to ensure the material is compatible with industry standards per the application such as ASME PCC-1-2010.

3.27.2 Installation steps

Follow these steps to install the WFW Lower housing on an existing process piping system:

1. Put the washers on the bolts.
2. Insert two bolts in the bottom bolt holes of the flange on the lower housing.
- ⚠ 3. Place the appropriate gasket for the application on flanges connecting to the pipe. Failure to properly install the gasket may cause process leaks, which can result in death or serious injury.
4. Insert two bolts into the bottom holes on the opposite end of the lower housing.
- ⚠ 5. Place the appropriate gasket for the application on flanges connecting to the pipe. Failure to properly install the gasket may cause process leaks, which can result in death or serious injury.
6. Using the previously installed bolts, attach the lower housing and gasket to the process connection.
7. Loosely fasten the nuts onto the bolts.
8. Insert remaining bolts in the flanges and hand-tighten the nuts.

9. Using a torque wrench on the bolt head and a standard wrench on the nut, tighten the assembly in a cross-pattern to ensure even installation. The bolts should be torqued to the specifications outlined by ANSI B16.5, EN 1092-1, or JIS B 2210 flange torque requirements. Required torque is a function of the gasket material and surface treatment of the bolts and nuts, which are end-user-supplied. For four bolts, the tightening pattern should be 1, 3, 2, 4; for eight bolts, the tightening pattern should be 1, 5, 3, 7, 2, 6, 4, 8; for twelve bolts the tightening pattern should be 1, 9, 5, 3, 11, 7, 2, 10, 6, 4, 12, 8. Tighten 20 to 30 percent, check the gap, tighten 50 to 70 percent, check flange gap and uniformity, and continue to tighten in the appropriate pattern until you reach 100 percent torque value. Time permitting, wait a minimum of four hours and repeat the torque pattern to restore any short term creep/relaxation in the connection. Consider leak checking the installation to ensure a robust connection.
-  10. Place the gasket into the lower housing make sure the gasket is properly aligned on the gasket sealing surface. Failure to properly install the gasket may cause process leaks, which can result in death or serious injury.
11. Insert the WFW seal body into the lower housing.
12. Loosely insert the bolts into the lower housing.
13. Using a torque wrench tighten the assembly in a cross-pattern to ensure even installation. The bolts should be torqued to 180 in-lb (20 N-m) with stainless or carbon steel bolts. For eight bolts, the tightening pattern should be 1, 5, 3, 7, 2, 6, 4, 8. Tighten 20 to 30 percent, check the gap, tighten 50 to 70 percent, check gap and uniformity, and continue to tighten in the appropriate pattern until you reach 100 percent torque value. Time permitting, wait a minimum of four hours and repeat the torque pattern to restore any short term creep/relaxation in the connection. Consider leak checking the installation to ensure a robust connection.

Section 4 Configuration

Calculating range points page 77
DP Level transmitter installation best practices page 84

4.1 Calculating range points

4.1.1 Remote seals

Calculating range points

- Open tank (zero based)⁽¹⁾
- Open tank (non-zero based)
- Closed tank (non-zero based)

1. "Zero based" means 4 mA equals 0 inH₂O.

Transmitters installation best practice

- Open tank (zero based)⁽¹⁾
- Closed tank (non-zero based)
- Zero trim via HART[®] Communicator
- Re-range via zero button
- Re-range via HART Communicator
- Scale display

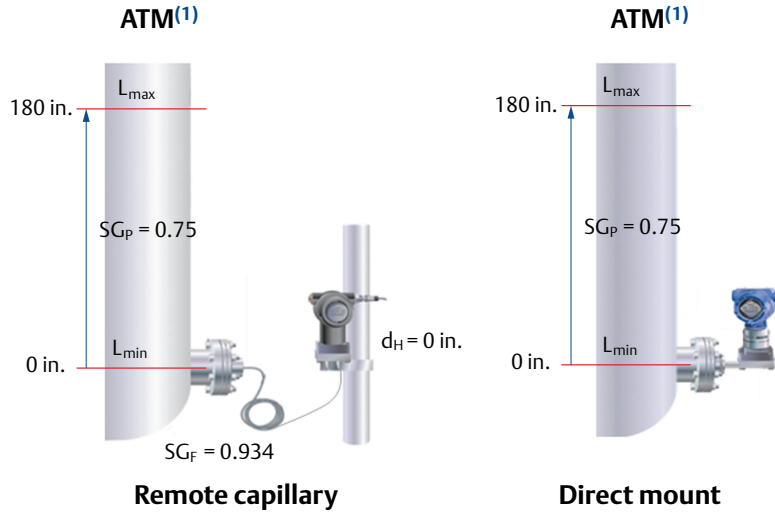
1. "Zero based" means 4 mA equals 0 inH₂O.



1. ATM: open to atmosphere.

4.1.2 Zero-based lower range value

Figure 4-1. Remote Capillary and Direct Mount



d_H = vertical distance from transmitter to high pressure seal
 d_L = vertical distance from transmitter to low pressure seal
 L_{max} = the maximum level of process above the high pressure seal and typically the 20 mA lower range value
 L_{min} = the minimum level of process above the high pressure seal and typically the 4 mA lower range value
 SG_F = specific gravity of fill fluid
 SG_P = specific gravity of process fluid

1. ATM: open to atmosphere.

$$\begin{aligned}
 \text{Tank span} &= L_{max} \times SG_P - L_{min} \times SG_P \\
 &= (180 \text{ in.} \times 0.75) - (0 \text{ in.} \times 0.75) = 81 \text{ inH}_2\text{O} \\
 4 \text{ mA} &= L_{min} \times SG_P + d_H \times SG_F \\
 &= (0 \text{ in.} \times 0.75) + (0 \text{ in.} \times 0.934) = 0 \text{ inH}_2\text{O} \\
 20 \text{ mA} &= L_{max} \times SG_P + d_H \times SG_F \\
 &= (180 \text{ in.} \times 0.75) + (0 \text{ in.} \times 0.934) = 81 \text{ inH}_2\text{O} \\
 \text{Span} &= 81 \text{ inH}_2\text{O} (81 \text{ to } 0 \text{ inH}_2\text{O})
 \end{aligned}$$

Note

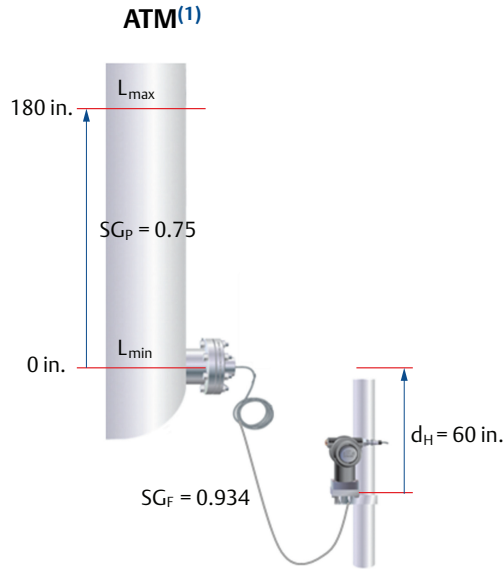
Both installations would have the same calculated range points.

Note

Silicone 200 has a specific gravity of 0.934.

4.1.3 Non-zero based lower range value

Figure 4-2. Remote Capillary



- d_H = vertical distance from transmitter to high pressure seal
 d_L = vertical distance from transmitter to low pressure seal
 L_{max} = the maximum level of process above the high pressure seal and typically the 20 mA lower range value
 L_{min} = the minimum level of process above the high pressure seal and typically the 4 mA lower range value
 SG_F = specific gravity of fill fluid
 SG_P = specific gravity of process fluid

1. ATM: open to atmosphere.

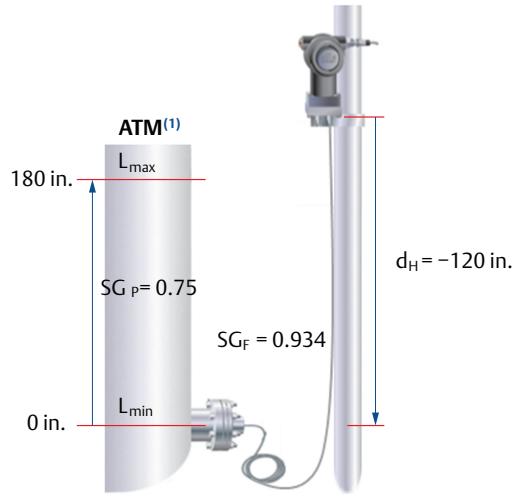
$$\begin{aligned}
 \text{Tank span} &= L_{max} \times SG_P - L_{min} \times SG_P \\
 &= (180 \text{ in.} \times 0.75) - (0 \text{ in.} \times 0.75) = 81 \text{ inH}_2\text{O} \\
 4 \text{ mA} &= L_{min} \times SG_P + (d_H \times SG_F) \\
 &= (0 \text{ in.} \times 0.75) + (60 \text{ in.} \times 0.934) = 56.04 \text{ inH}_2\text{O} \\
 20 \text{ mA} &= L_{max} \times SG_P + (d_H \times SG_F) \\
 &= (180 \text{ in.} \times 0.75) + (56.04 \text{ inH}_2\text{O}) = 137.04 \text{ inH}_2\text{O} \\
 \text{Span} &= 81 \text{ inH}_2\text{O} \text{ (137.04 to 56.04 inH}_2\text{O)}
 \end{aligned}$$

Note

Silicone 200 has a specific gravity of 0.934.

4.1.4 Non-zero based lower range value (transmitter mounted above seal)

Figure 4-3. Remote Capillary



d_H = vertical distance from transmitter to high pressure seal

d_L = vertical distance from transmitter to low pressure seal

L_{max} = the maximum level of process above the high pressure seal and typically the 20 mA lower range value

L_{min} = the minimum level of process above the high pressure seal and typically the 4 mA lower range value

SG_F = specific gravity of fill fluid

SG_P = specific gravity of process fluid

1. ATM: open to atmosphere.

$$\begin{aligned} \text{Tank span} &= L_{max} \times SG_P - L_{min} \times SG_P \\ &= (180 \text{ in.} \times 0.75) = 81 \text{ inH}_2\text{O} \end{aligned}$$

$$\begin{aligned} 4 \text{ mA} &= L_{min} \times SG_P + (d_H \times SG_F) \\ &= (0 \text{ in.} \times 0.75) + (-120 \text{ in.} \times 0.934) = -112.08 \text{ inH}_2\text{O} \end{aligned}$$

$$\begin{aligned} 20 \text{ mA} &= L_{max} \times SG_P + (d_H \times SG_F) \\ &= (180 \text{ in.} \times 0.75) + (-120 \text{ in.} \times 0.934) = -31.08 \text{ inH}_2\text{O} \end{aligned}$$

$$\text{Span} = 81 \text{ inH}_2\text{O} (-112.08 \text{ to } -31.08 \text{ inH}_2\text{O})$$

Note

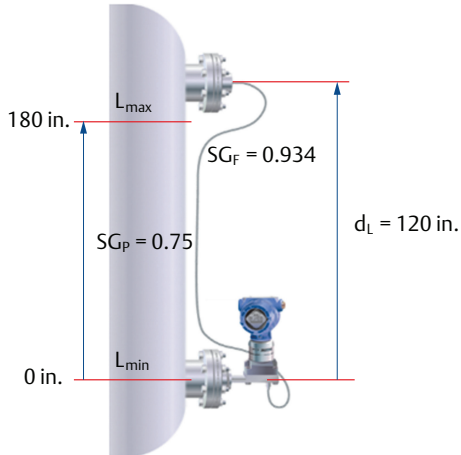
The height of the transmitter ($H_d \times S_g$) should not be greater than approximately 394 inH₂O (14.2 PSI) not to exceed the 0.5 PSIA sensor limits of a coplanar DP or GP.

Note

Silicone 200 has a specific gravity of 0.934.

4.1.5 Non-zero based lower range value (Tuned-System assembly)

Figure 4-4. Tuned-System™



d_H = vertical distance from transmitter to high pressure seal

d_L = vertical distance from transmitter to low pressure seal

L_{max} = the maximum level of process above the high pressure seal and typically the 20 mA lower range value

L_{min} = the minimum level of process above the high pressure seal and typically the 4 mA lower range value

SG_F = specific gravity of fill fluid

SG_P = specific gravity of process fluid

$$\begin{aligned} \text{Tank span} &= L_{max} \times SG_P - L_{min} \times SG_P \\ &= (180 \text{ in.} \times 0.75) = 81 \text{ inH}_2\text{O} \end{aligned}$$

$$\begin{aligned} 4 \text{ mA} &= L_{min} \times SG_P - (d_L \times SG_F) \\ &= (0 \text{ in.} \times 0.75) - (120 \text{ in.} \times 0.934) = -112.08 \text{ inH}_2\text{O} \end{aligned}$$

$$\begin{aligned} 20 \text{ mA} &= L_{max} \times SG_P - (d_L \times SG_F) \\ &= (180 \text{ in.} \times 0.75) - (120 \text{ in.} \times 0.934) = -31.08 \text{ inH}_2\text{O} \end{aligned}$$

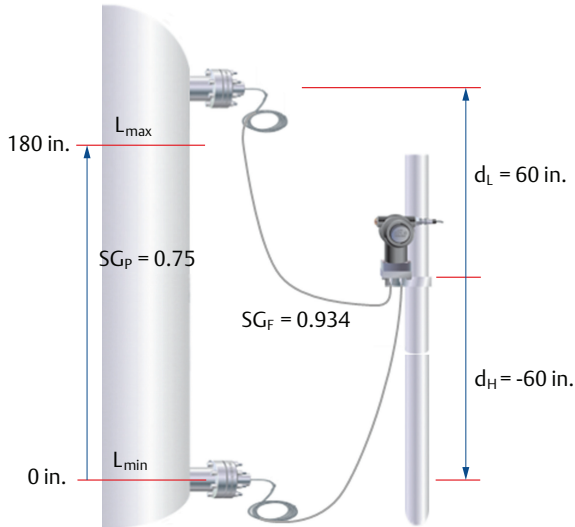
$$\text{Span} = 81 \text{ inH}_2\text{O} (-112.08 \text{ to } -31.08 \text{ inH}_2\text{O})$$

Note

Silicone 200 has a specific gravity of 0.934.

4.1.6 Non-zero based lower range value (balanced system with transmitter between seals)

Figure 4-5. Balanced System



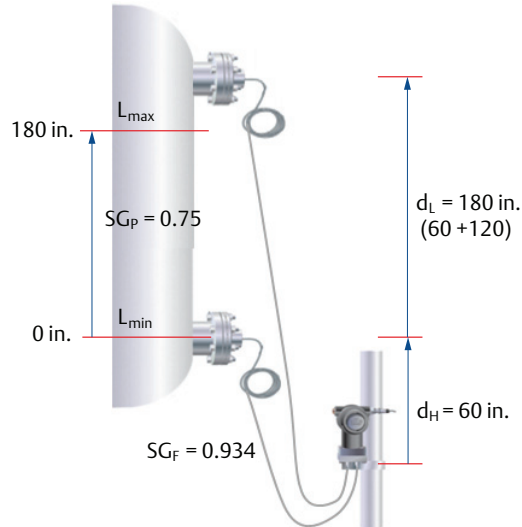
d_H = vertical distance from transmitter to high pressure seal
 d_L = vertical distance from transmitter to low pressure seal
 L_{max} = the maximum level of process above the high pressure seal and typically the 20 mA lower range value
 L_{min} = the minimum level of process above the high pressure seal and typically the 4 mA lower range value
 SG_F = specific gravity of fill fluid
 SG_P = specific gravity of process fluid

$$\begin{aligned}
 \text{Tank span} &= L_{max} \times SG \\
 &= 180 \text{ in.} \times 0.75 = 81 \text{ inH}_2\text{O} \\
 4 \text{ mA} &= L_{min} \times SG_P - (d_L \times SG_F) + (d_H \times SG_F) \\
 &= (0 \text{ in.} \times 0.75) - (60 \text{ in.} \times 0.934) + (-60 \text{ in.} \times 0.934) = -112.08 \text{ inH}_2\text{O} \\
 20 \text{ mA} &= L_{max} \times SG_P - (d_L \times SG_F) + (d_H \times SG_F) \\
 &= (180 \text{ in.} \times 0.75) - (60 \text{ in.} \times 0.934) + (-60 \text{ in.} \times 0.934) = -31.08 \text{ inH}_2\text{O} \\
 \text{Span} &= 81 \text{ inH}_2\text{O} (-112.08 \text{ to } -31.08 \text{ inH}_2\text{O})
 \end{aligned}$$

Note
Silicone 200 has a specific gravity of 0.934.

4.1.7 Non-zero based lower range value (balanced system with transmitter below seals)

Figure 4-6. Remote Capillary



d_H = vertical distance from transmitter to high pressure seal
 d_L = vertical distance from transmitter to low pressure seal
 L_{max} = the maximum level of process above the high pressure seal and typically the 20 mA lower range value
 L_{min} = the minimum level of process above the high pressure seal and typically the 4 mA lower range value
 SG_F = specific gravity of fill fluid
 SG_P = specific gravity of process fluid

$$\begin{aligned}
 \text{Tank span} &= L_{max} \times SG \\
 &= 180 \text{ in.} \times 0.75 = 81 \text{ inH}_2\text{O} \\
 4 \text{ mA} &= L_{min} \times SG_P - (d_L \times SG_F) + (d_H \times SG_F) \\
 &= (0 \text{ in.} \times 0.75) - (180 \text{ in.} \times 0.934) + (60 \text{ in.} \times 0.934) = -112.08 \text{ inH}_2\text{O} \\
 20 \text{ mA} &= L_{max} \times SG_P - (d_L \times SG_F) + (d_H \times SG_F) \\
 &= (180 \text{ in.} \times 0.75) - (180 \text{ in.} \times 0.934) + (60 \text{ in.} \times 0.934) = -31.08 \text{ inH}_2\text{O} \\
 \text{Span} &= 81 \text{ inH}_2\text{O} (-112.08 \text{ to } -31.08 \text{ inH}_2\text{O})
 \end{aligned}$$

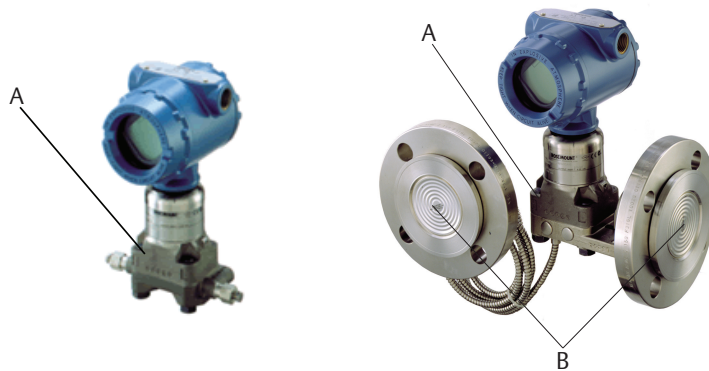
Note
Silicone 200 has a specific gravity of 0.934.

Note
The transmitter location in a closed tank does not effect the 4 mA and 20 mA set points as shown in example A, B, and C.

4.2 DP Level transmitter installation best practices

Pressure transmitters have a sensor module with a primary fill fluid. Therefore, the mounting position of a standard transmitter with silicon fill could read approx ± 1.25 inH₂O worst case after installation. This is simply zeroed out using a HART Communicator after installation so that it will read zero pressure. With a remote seal attached you have additional components that will create additive pressure that would increase the amount of potential shift. This would include the secondary fill fluid in the remote seal assembly along with the potential of torquing effects when the assembly is bolted to the process. For these reasons, the transmitter's digital output will most likely not match the exact values calculated on paper. Even a redundant transmitter would most likely not read the exact digital values after being installed. For these reasons, a re-range function is common practice after all installations.

Pressure transmitter Pressure transmitter with remote seal



A. Primary fill
B. Secondary fill

What is important is the calculated span (level height \times specific gravity of the process). After the transmitter is mounted, it is common and best practice to re-range the transmitter so that the 4 mA point will be the installed digital value. The 20 mA point would then be set based on the calculated span value setting it above the installed digital value.

The procedure would be based on mounting configuration (zero based) 4 mA = 0 inH₂O or (non-zero based) 4 mA exceeds the $\pm 3\%$ of the upper sensor limit (USL).

4.2.1 Open tank (zero based)

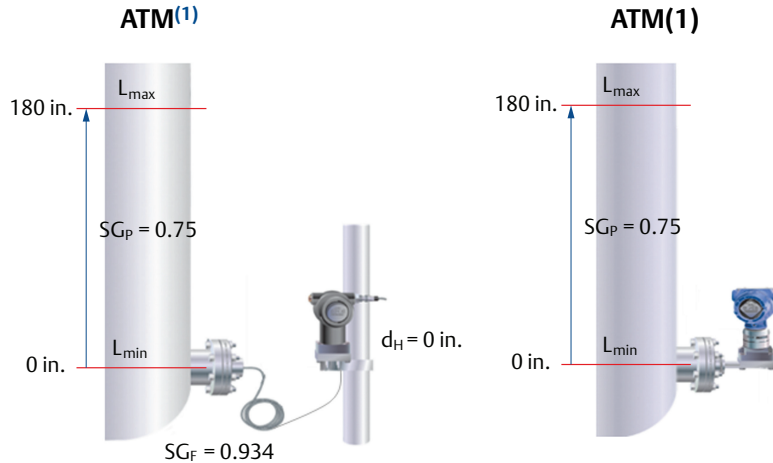
With open tank level applications this value can typically be zeroed out using a HART device as long as it is $< 3\%$ USL. The maximum value that can be zeroed out is 3% of the USL or 7.5 inH₂O for a range 2 (250 inH₂O) sensor.

4.2.2 Closed tank (non-zero based)

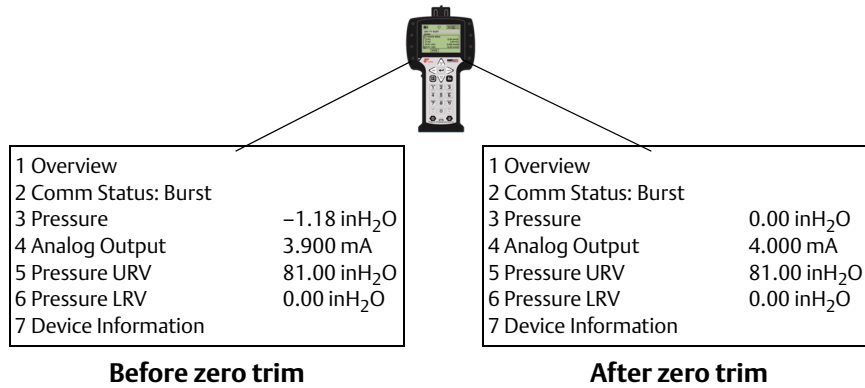
For closed tank level applications, this value is most likely too high and cannot be zeroed out due to the applied pressure of the secondary fill fluid. For this reason, the transmitter would simply be re-ranged so that the 0% value (4 mA) would equal the installed value. The 100 percent, (20 mA) would be adjusted to the required calculated span.

4.2.3 Open tank example (zero-based lower range value) with HART Communicator

Figure 4-7. Open Tank



1. ATM: open to atmosphere.



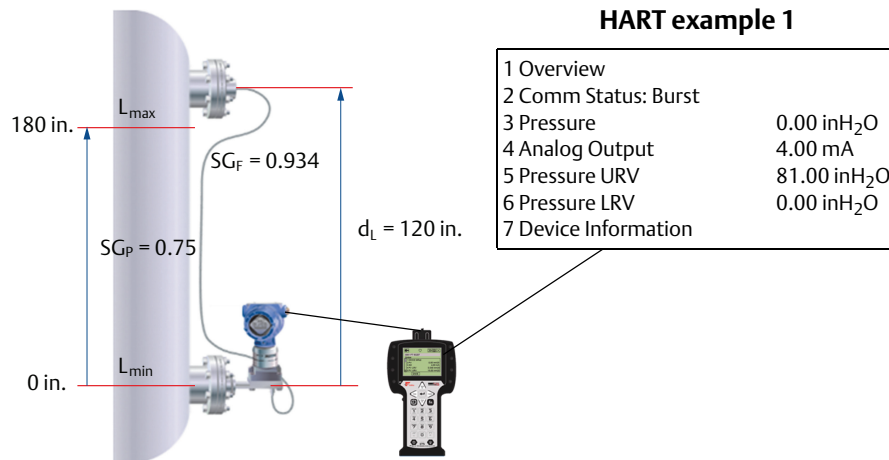
Perform a zero trim via HART Communicator after installation for zero based lower range values.

4.2.4 Closed tank example (non-zero based lower range value)

Note

For FOUNDATION™ Fieldbus, refer to the AI Function Blocks in reference manual.

Figure 4-8. Tuned-System



Tank span (based on design) = 81 inH₂O

1. Initial bench set up for pressure verification if required (range transmitter): seals on same elevation.
If the transmitter does not require bench pressure verification, skip [Step 1](#) and proceed to [Step 2](#).

(Pressure verification)

Power and range the transmitter using a HART Communicator to the required tank span. ([Figure 4-8](#) example) With the required calibration fixture attached to the seal assemble apply pressure.

4 mA = 0 inH₂O

20 mA = 81 inH₂O

2. Mount the transmitter and bolt the seal to the process taps. Most common is high sensor side is mounted to low process tap and low sensor side is mounted to high process tap.
3. Wire and apply power to the transmitter.
4. If the transmitter has a zero button, push the **Zero** button. This will automatically re-range the transmitter so the LRV (4 mA) will equal the current applied pressure value and the 20 mA URV will equal the span value.

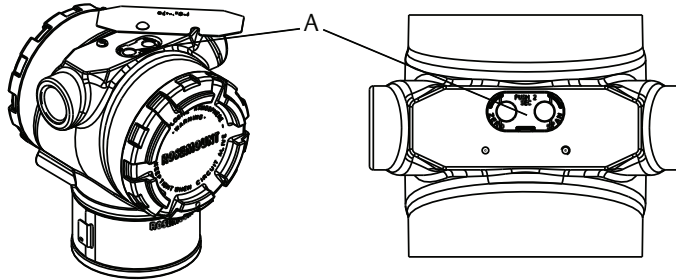
Example

With the transmitter ranged 4 mA = 0 and 20 mA = 81 inH₂O per [Figure 4-8](#), after mounting and pushing the **Zero** button the transmitter would now be ranged
4 mA = -112.08 and 20 mA = -31.08 inH₂O per example from [Figure 4-4](#).

Note

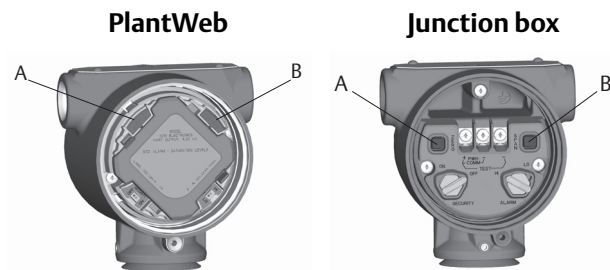
If you have a HART Communicator device hooked up when the **Zero** button is pushed, you have to re-boot the HART Communicator to see the change.

Figure 4-9. Zero and Span Buttons on Rosemount 3051S



A. Zero and span buttons

Figure 4-10. Transmitter Adjustment Buttons

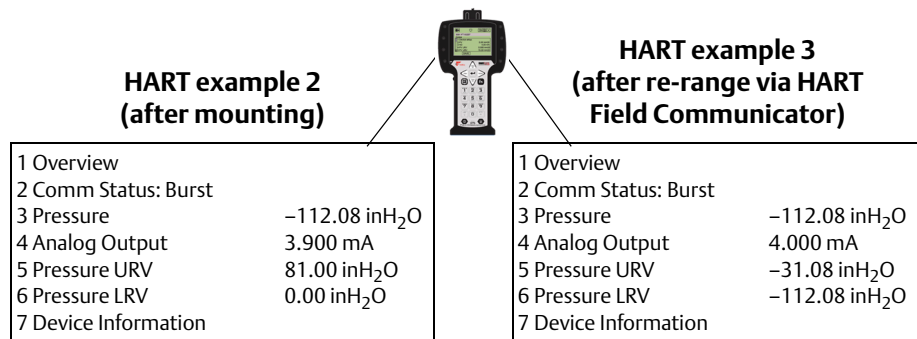


A. Zero
B. Span

- If the transmitter does not have a zero button, use a HART Communicator and re-range the transmitter so the lower range value (LRV) is equal to the current applied pressure.

Example

After mounting transmitter pressure reads -112.08, re-range transmitter so (4 mA point) LRV = -112.88 and the (20 mA point) URV = -31.88 inH₂O which is based on span of 81 in H₂O. Values are shown in [HART example 3](#).



- After mounting transmitter pressure reads -112.08, re-range transmitter so (4 mA point) LRV = -112.88 and the (20 mA point) URV = -31.88 inH₂O which is based on Span of 81 inH₂O. Values are shown in [HART example 3](#).

If the device has a display and you want to configure it to something other than standard default, which is Engineering units, go to [Scale display with HART Communicator](#).

4.2.5 Scale display with HART Communicator

After the transmitter is installed, you can scale the display to match the DCS or PLC as required. As an example, in [Figure 4-8 on page 86](#), if the required display should be 0 to 81 inH₂O, this can be done using a HART Communicator. See the following steps for the Rosemount 3051S or the Rosemount 3051C. Often 0 to 100 percent is sufficient.

Note

Depending on the HART device (Hand held/AMS Wireless Configurator) DD the following steps may be slightly different.

For the Rosemount 3051S, in the HART menu tree, go to the *Scaled variable Config* (under guided set up). Follow the steps below:
Bold text indicates entered value.

1. Enter SV unit:
(enter) **inH₂O**
2. Select Scaled data option:
(select) **Linear**
3. Enter Pressure value position 1:
(enter) **-112.08**
4. Enter Scaled Variable position 1:
(enter) **0**
5. Enter Pressure value position 2:
(enter) **-31.08**
6. Enter Scaled Variable position 2:
(enter) **81**
7. Enter Linear Offset:
(enter) **0.00**

For the Rosemount 3051S, go to *Display* (under manual setup).

1 Pressure	OFF
2 Scaled Variable	ON
3 Module Temperature	OFF
4 Percent of Range	OFF

For the Rosemount 3051C, in the HART Communicator, go to *Configure Display* and follow the following steps:

1. Display Option:
(select) **Custom meter Display**
2. Decimal Places:
(enter) **3** (send before step 3)
3. Upper Range Value
(enter) **81.000**
4. Lower Range Value
(enter) **0.000**
5. Transfer Function
(select) **Linear**
6. Units
(enter) **inH₂O**

Note

In both cases with the transmitter ranged -112.08 to -31.08 inH₂O, the display will show 0 inH₂O at (4 mA) and 81.00 inH₂O at (20 mA).

Section 5 Fill Fluids Specifications

Quality	page 89
Fill fluid selection	page 89
Fill fluids vapor pressure curve graphs	page 90

This section discusses the process of selecting the appropriate fill fluid using vapor pressure curves. To see the list of available Rosemount™ fill fluids, view the Rosemount DP Level Fill Fluid Specifications [Technical Note](#), or reference the Rosemount DP Level Transmitters and 1199 Remote Seals [Product Data Sheet](#).

5.1 Quality

5.1.1 Specialized processing

Emerson™ has implemented proprietary processes to eliminate impurities and contaminations in the fill fluid. This additional processing ensures stable measurement and optimal performance under extreme temperatures and vacuum conditions. The proprietary equipment and procedures used to build remote seal systems for high temperature/high vacuum applications are continuously improved to deliver products that meet ever increasing application demands. Tight quality control measures such as helium leak checking of system welds ensures the reliability of every seal system. Additional quality checks include continual station leak and health tests to confirm the fill quality of the finished seal system.

5.1.2 Testing

Emerson’s vapor pressure curves are derived from empirical lab testing in real devices at both vacuum conditions and at the maximum continuous temperature at one atmosphere of pressure. The maximum continuous temperature at one atm of pressure correlates to the thermal stability of the fill fluid, which is the maximum temperature the fill fluid will remain in its original molecular form. Over time, exceeding the maximum recommended temperature may result in the decomposition or vaporization of the fill fluid, resulting in device failure.

5.2 Fill fluid selection

Fill fluid selection is very important to the safety and reliability of your measurement application.

5.2.1 Type of fill fluid

Different types of fill fluids exist to meet the needs of different applications. An all-purpose fill fluid can be used in most applications. However, some processes might require a fill fluid that is chemically inert to avoid reactions with oxygen. In the food and pharmaceutical industries, a hygienic fill fluid may be needed that meets various industry standards.

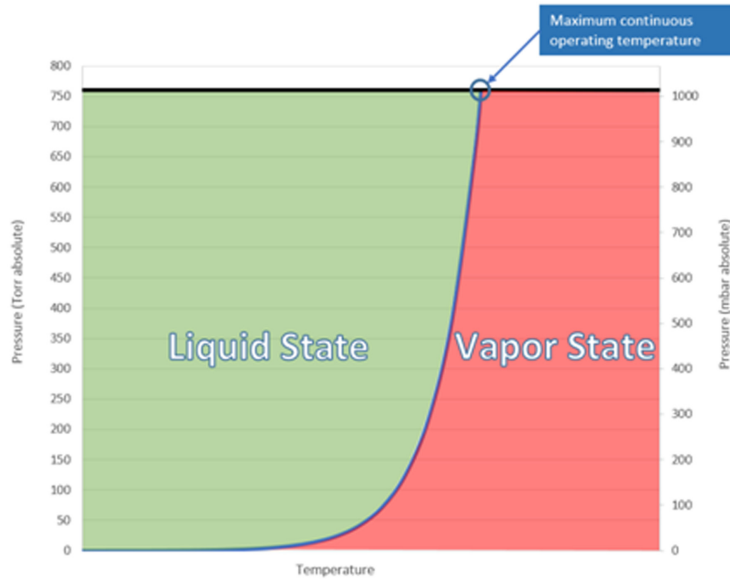
5.2.2 Maximum and minimum temperatures

When selecting a fill fluid, the process and ambient temperatures must be within the specified temperature range of the fill fluid. Too hot can cause the fill fluid to vaporize or yield thermal stability issues. Too cold can cause the fill fluid to gel, which slows the time response or can even render the system unresponsive.

5.2.3 Process pressure and temperature

When the process is under vacuum conditions (below 14.7 psia), the fill fluid will vaporize at a lower temperature than when it is operating under normal atmospheric or greater pressure. If the fill fluid vaporizes, the seal system is permanently damaged. Emerson offers numerous types of fill fluids for remote seal systems, each fill fluid has a specific vapor-pressure curve. The vapor-pressure curve indicates the pressure and temperature relationship where the fluid is in a liquid or vapor state. Safe and reliable system operation requires the fill fluid to remain in a liquid state.

Figure 5-1. Liquid vs. Pressure State Under Vacuum



The thermal stability point of a fill fluid is equal to its maximum temperature at one atmosphere. This point translates to the maximum continuous operating temperature of the fill fluid.

5.3 Fill fluids vapor pressure curve graphs

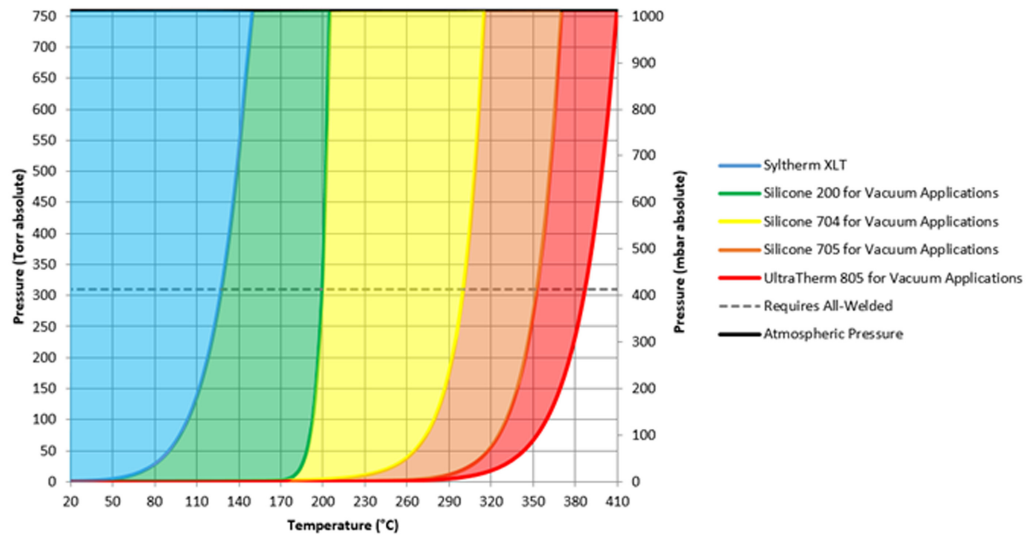
5.3.1 How to use the vapor pressure curves

Take each temperature and pressure of your process cycle and find where each point falls on the graph above (Figure 5-1). Whichever fill fluid that is farthest to the right containing a point of your process cycle is most likely the correct fill fluid for your application.

Note

Fill fluids can operate at lower temperatures than their shaded section shown in Figure 5-2 on page 91. For exact minimum operating temperatures, consult the Rosemount DP Level Fill Fluid Specifications [Technical Note](#).

Figure 5-2. General Use Fill Fluids Vapor Pressure Curves



5.3.2 Fill fluid selection example

In an application that has a maximum process temperature of 140 °C and a maximum pressure of 700 Torr, SYLTHERM™ XLT would be recommended. However, say the process pressure drops to 200 Torr and 140 °C at one point during the process cycle, then Silicone 200 for vacuum applications would be recommended because it is the fill fluid farthest to the right that the process falls into.

5.3.3 Fill fluid specifications

Rosemount fill fluid properties, vapor pressure curves, and specifications can be found in the Rosemount DP Level Fill Fluid Specifications [Technical Note](#).

Section 6 Maintenance and Troubleshooting

Cleaning	page 93
Troubleshooting	page 93
Service support	page 95

6.1 Cleaning

Avoid using abrasive agents or high pressure water jets when cleaning the remote seals.

6.1.1 Return of materials

Within the United States, call the North American Response Center using the 1-800-654-RSMT (7768) toll-free number. This center, available 24 hours a day, will assist you with any needed information or materials.

Outside of the United States, contact your local Emerson™ representative (support center addresses and phone numbers are on the [Title page](#) of this manual).

The center will ask for product model and serial numbers, and will provide a Return Material Authorization (RMA) number. The center will also ask for the name of the process material the product was last exposed to.

▲ WARNING

Mishandling products exposed to a hazardous substance can cause death or serious injury. If the product being returned was exposed to a hazardous substance as defined by OSHA, a copy of the required Material Safety Data Sheet (MSDS) for each hazardous substance identified must be included with the returned goods.

6.2 Troubleshooting

Remote seal systems are factory filled systems that cannot be refilled in the field. Do not attempt to disconnect the seals or capillaries from the transmitter. Doing so can damage the seal system assembly and voids the product warranty. The table below lists possible problems, their potential sources, and, where applicable, a corrective action:

Table 6-1. Troubleshooting Seal Systems

PROBLEM NO RESPONSE symptom	Potential source	Corrective action
No output	Electrical problem	See the troubleshooting section of the transmitter manual for more extensive information.
		Check for adequate voltage to the transmitter.
		Check the milliampere rating of the power supply against the total current being drawn for all transmitters being powered.
		Check for shorts and multiple grounds.
		Check for proper polarity at the transmitter terminal.
		Check loop impedances.
		⚠ CAUTION
		Do not use higher than the specified voltage to check the loop, or the transmitter electronics may be damaged.
See if the transmitter is in a multidrop mode. The multidrop mode locks the output at 4 mA.		
SLOW RESPONSE symptom	Potential source	Corrective action
Slow response	Damping too high	See the “Damping Adjustment” information in the Calibration section of the transmitter manual.
	Cold temperature	Fill fluid viscosity is temperature dependent. Less viscous fill fluid enhances time response. Heat traced capillaries can be added as an option to maintain constant temperatures to fill fluid.
DRIFTING Symptom	Potential source	Corrective action
Drifting	Temperature effect	If pressure measurement is changing, refer to “Understanding seal system performance” on page 4 for more information. Running Instrument Toolkit™ will calculate the expected performance for the seal system. Refer to “Instrument Toolkit: seal ordering and application process” on page 10 for more information.
Output reads negative pressure	Mounting effect	The output will read negative as the remote fill fluid is applying pressure to the low side. See Section 4: Configuration .
Will not respond to change in pressure	Damaged diaphragm	Remove seal and inspect diaphragm.

6.3 Service support

To expedite the return process outside of the United States, contact the nearest Emerson Process Management representative.

Within the United States, call the Emerson Instrument and Valves Response Center using the 1-800-654-RSMT (7768) toll-free number. This center, available 24 hours a day, will assist you with any needed information or materials.

The center will ask for product model and serial numbers, and will provide a Return Material Authorization (RMA) number. The center will also ask for the process material to which the product was last exposed.

⚠ CAUTION

Individuals who handle products exposed to a hazardous substance can avoid injury if they are informed of and understand the hazard. If the product being returned was exposed to a hazardous substance as defined by OSHA, a copy of the required Material Safety Data Sheet (MSDS) for each hazardous substance identified must be included with the returned goods.

Emerson Instrument and Valves Response Center representatives will explain the additional information and procedures necessary to return goods exposed to hazardous substances.

Appendix A Specifications and Reference Data

Rosemount 1199 Direct Mount Seal Systems	page 97
Rosemount 1199 Remote Mount Seal Systems	page 103
Dimensional drawings	page 110
Spare parts	page 115

A.1 Rosemount 1199 Direct Mount Seal Systems



Tuned-system assembly comprised of Rosemount 1199 Direct Mount Seal combined with 1199 Remote Mount Seal

Rosemount 1199 Direct Mount Seals reduce installation costs by eliminating mounting hardware. Their advanced design also minimizes oil volume improving performance.

Product features and capabilities include:

- Direct mount gage or absolute seal system can be used for open or vented to atmosphere tank applications.
- Tuned-system assembly order codes can be used to improve performance for DP measurements in closed or pressurized tank applications.
- Variety of process connections.
- Quantified performance for the entire transmitter/seal assembly (QZ option).

A.1.1 Rosemount 1199 Direct Mount Seal

The Rosemount 1199 Direct Mount Seal also requires specification of a Rosemount pressure device. See the appropriate Product Data Sheet for the desired device and include the option indicated in [Table A-1](#) for the configuration desired.

Specification and selection of product materials, options, or components must be made by the purchaser of the equipment.

When ordering Rosemount 1199 Direct and Remote Mount Seals, add the correct seal system ordering code to the transmitter or gage model.

Table A-1. Direct Mount Seal Attach To Code Per Transmitter or Gage Model

Rosemount model	Two seals	One seal
3051S_C	B12	B11
3051C	S2	S1
2051C	S2	S1
3051S_T	N/A	B11
3051T, 3051HT, 2051T, 2088	N/A	S1
WPG	N/A	S1

A Rosemount 1199 Direct Mount Seal consists of two parts. First, specify the direct mount connection model codes found on [page 98](#). Then, specify a remote seal found on [page 100](#).

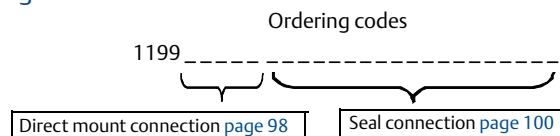


Table A-2. Rosemount 1199 Direct Mount Seal Systems Ordering Information

The starred offerings (★) represent the most common options and should be selected for best delivery. The non-starred offerings are subject to additional delivery lead time.

Rosemount Model	Product description						
1199	Seal systems						
Connection type		Seal system			Seal location		
All coplanar devices (Rosemount 3051S_C, 3051C, and 2051C)							
W	Welded-repairable	One or two seal system			High side of transmitter		★
R ⁽¹⁾	All welded	One seal system			High side of transmitter		★
T ⁽¹⁾	All welded	Two seal system			High side of transmitter		★
All In-line devices (Rosemount 3051S_T, 3051T, 3051HT, 2051T, 2088, and WPG)							
W	All welded	One seal system			N/A		★
Seal fill fluid		Specific gravity at 77 °F (25 °C)	Temperature limits ⁽²⁾				
			No extension	2-in. (50 mm) extension	4-in. (100 mm) extension	Thermal optimizer	
D	Silicone 200	0.93	-49 to 401 °F (-45 to 205 °C)	-49 to 401 °F (-45 to 205 °C)	-49 to 401 °F (-45 to 205 °C)	-49 to 401 °F (-45 to 205 °C)	★
F	Silicone 200 for vacuum applications	0.93	For use in vacuum applications below 14.7 psia (1 bar-a), refer to vapor pressure curves in Rosemount DP Level Fill Fluid Specification Technical Note.				★
J ⁽³⁾	Tri-Therm 300	0.795	-40 to 401 °F (-40 to 205 °C)	-40 to 464 °F (-40 to 240 °C)	-40 to 500 °F (-40 to 260 °C)	-40 to 572 °F (-40 to 300 °C)	★
Q ⁽³⁾	Tri-Therm 300 for vacuum Applications	0.795	For use in vacuum applications below 14.7 psia (1 bar-a), refer to vapor pressure curves in Rosemount DP Level Fill Fluid Specification Technical Note.				★
L	Silicone 704	1.07	32 to 401 °F (0 to 205 °C)	32 to 464 °F (0 to 240 °C)	32 to 500 °F (0 to 260 °C)	32 to 599 °F (0 to 315 °C)	★
C	Silicone 704 for vacuum applications	1.07	For use in vacuum applications below 14.7 psia (1 bar-a), refer to vapor pressure curves in Rosemount DP Level Fill Fluid Specification Technical Note.				★
R	Silicone 705	1.09	68 to 401 °F (20 to 205 °C)	68 to 464 °F (20 to 240 °C)	68 to 500 °F (20 to 260 °C)	68 to 698 °F (20 to 370 °C)	★
V	Silicone 705 for vacuum applications	1.09	For use in vacuum applications below 14.7 psia (1 bar-a), refer to vapor pressure curves in Rosemount DP Level Fill Fluid Specification Technical Note.				★
A	Syltherm XLT	0.85	-157 to 293 °F (-105 to 145 °C)	-157 to 293 °F (-105 to 145 °C)	-157 to 293 °F (-105 to 145 °C)	-157 to 293 °F (-105 to 145 °C)	★
H	Inert (halocarbon)	1.85	-49 to 320 °F (-45 to 160 °C)	-49 to 320 °F (-45 to 160 °C)	-49 to 320 °F (-45 to 160 °C)	-49 to 320 °F (-45 to 160 °C)	★
G ⁽³⁾⁽⁴⁾	Glycerine and water	1.13	5 to 203 °F (-15 to 95 °C)	5 to 203 °F (-15 to 95 °C)	5 to 203 °F (-15 to 95 °C)	5 to 203 °F (-15 to 95 °C)	★






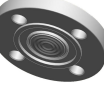
Table A-2. Rosemount 1199 Direct Mount Seal Systems Ordering Information

The starred offerings (★) represent the most common options and should be selected for best delivery. The non-starred offerings are subject to additional delivery lead time.









N ⁽³⁾	Neobee M-20	0.92	5 to 401 °F (-15 to 205 °C)	5 to 437 °F (-15 to 225 °C)	5 to 437 °F (-15 to 225 °C)	5 to 437 °F (-15 to 225 °C)	★
P ⁽³⁾⁽⁴⁾	Propylene glycol and water	1.02	5 to 203 °F (-15 to 95 °C)	5 to 203 °F (-15 to 95 °C)	5 to 203 °F (-15 to 95 °C)	5 to 203 °F (-15 to 95 °C)	★
Seal connection type							
A	Direct mount						★
Direct mount connection type							
	Extension length			Seal system		Connection type	
All coplanar devices (Rosemount 3051S_C, 3051C and 2051C)							
94	Direct mount, no extension			Tuned-system assembly, two seals		Welded-repairable	
93	Direct mount, no extension			One seal system		Welded-repairable	
96	Direct mount, no extension			Tuned-system assembly, two seals		All welded	
97	Direct mount, no extension			One seal system		All welded	
B4	Direct mount, 2-in. (50 mm) extension			Tuned-system assembly, two seals		Welded-repairable	
B3	Direct mount, 2-in. (50 mm) extension			One seal system		Welded-repairable	
B6	Direct mount, 2-in. (50 mm) extension			Tuned-system assembly, two seals		All welded	
B7	Direct mount, 2-in. (50 mm) extension			One seal system		All welded	
D4	Direct mount, 4-in. (100 mm) extension			Tuned-system assembly, two seals		Welded-repairable	
D3	Direct mount, 4-in. (100 mm) extension			One seal system		Welded-repairable	
D6	Direct mount, 4-in. (100 mm) extension			Tuned-system assembly, two seals		All welded	
D7	Direct mount, 4-in. (100 mm) extension			One seal system		All welded	
All In-line devices (Rosemount 3051S_T, 3051T, 3051HT, 2051T, 2088, and WPG)							
95	Direct mount, no extension			One seal system		All welded	
D5	Thermal optimizer			One seal system		All welded	

1. All welded system connection types require either a 316L SST or alloy C-276 isolating diaphragm in the pressure transmitter model codes.
2. At ambient pressure of 14.7 psia (1 bar-a) and ambient temperature of 70 °F (21 °C).
3. This is a food grade fill fluid.
4. Not suitable for vacuum applications.




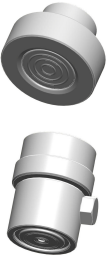



Continue specifying a completed model number by choosing a remote seal type below:
The starred offerings (★) represent the most common options and should be selected for best delivery. The non-starred offerings are subject to additional delivery lead time.

Flanged seal assemblies		● = Transmitter availability – = Unavailable				Process connections	
		In-Line	Coplanar extensions				
			0-in.	2-in.	4-in.		
	FFW flush flanged seal	●	(1)	●	●	2-in./DN 50/50A 3-in./DN 80/80A 4-in./DN 100/100A	★
	RFW remote flanged seal	●	–	●	●	1/2-in./DN 15 3/4-in. 1-in./DN 25/25A 1 1/2-in./DN 40/40A	★
	EFW extended flanged seal	●	(1)	●	●	1 1/2-in./DN 40/40A 2-in./DN 50/50A 3-in./Headbox/DN 80/80A 4-in./Headbox/DN 100/100A	★
	FCW flush flanged seal - Ring Type Joint (RTJ) gasket surface	●	(1)	●	●	2-in. 3-in.	
	RCW remote flanged seal - RTJ gasket surface	●	–	●	●	1/2-in. 3/4-in. 1-in. 1 1/2-in.	
	FUW and FVW flush flanged type seals	●	(2)	●	●	DN 50 DN 80	

The starred offerings (★) represent the most common options and should be selected for best delivery. The non-starred offerings are subject to additional delivery lead time.

Threaded seal assemblies		● = Transmitter availability – = Unavailable				Process connections	
		In-Line	Coplanar extensions				
	RTW threaded seal	●	–	●	●	1/4-18 NPT 3/8-18 NPT 1/2-14 NPT 3/4-14 NPT 1-1 1/2 NPT 1 1/4-11 1/2 NPT 1 1/2-11 1/2 NPT G 1/2 A DIN 16288 R 1/2 per ISO 7/1	★
	HTS male threaded seal	●	●	●	●	G1 G1 1/2 G2 1-1 1/2 NPT 1 1/2-11 1/2 NPT 2-11 1/2 NPT	
Hygienic seal assemblies							
	SCW hygienic Tri Clover style Tri Clamp seal	●	●	●	●	1 1/2-in. 2-in. 2 1/2-in. 3-in. 4-in.	★
	SSW hygienic tank spud seal	●	●	●	●	2-in. extension 6-in. extension	★
	STW hygienic thin wall tank spud seal	●	–	●	●	0.8-in. extension	
	EES hygienic flanged tank spud extended seal	●	●	●	●	DN 50 DN 80	
	VCS Tri Clamp in-line seal	●	–	–	–	1-in. 1 1/2-in. 2-in. 3-in. 4-in.	
	SVS VARIVENT® compatible hygienic connection seal	●	●	●	●	Tuchenhagen VARIVENT Compatible	

The starred offerings (★) represent the most common options and should be selected for best delivery. The non-starred offerings are subject to additional delivery lead time.

Hygienic seal assemblies		● = Transmitter availability – = Unavailable				Process connections	
		In-line	Coplanar extensions				
	SHP hygienic Cherry-Burrell "I" line seal	●	–	–	–	2-in. 3-in.	
	SLS dairy process connection - female thread seal per DIN 11851	●	–	–	–	DN 40 DN 50	
Specialty seal assemblies							
	WSP saddle seal	●	–	●	●	2-in. 3-in. 4-in. or larger	
	UCP male threaded pipe mount seals and PMW paper mill sleeve seals	●	–	–	–	1½-in. with threaded knurled nut 1-in. with cap screw retainer	
	CTW chemical tee seal	●	–	●	●	Retro-fit	
	TFS wafer style in-line seal	●	–	–	–	1-in./DN 25 1½-in./DN 40 2-in./DN 50 3-in./DN 80 4-in./DN 100	
	WFW flow-thru flanged seal	●	–	●	●	1-in. 2-in. 3-in.	

- Available with ANSI Class 300 or EN 1092-1 PN 40 or JIS B2238 20K or lower flange ratings.
- FUW and FVW with diaphragm options DA and DC are only available with one piece design (option code E).

A.2 Rosemount 1199 Remote Mount Seal Systems



Tuned-system assembly comprised of Rosemount 1199 Direct Mount Seal combined with Rosemount 1199 Remote Mount Seal

Rosemount 1199 Remote Mount Seals are used commonly at the top of the vessel when a DP measurement is required. The capillary that is used is available in three different diameters to optimize time response and reduce temperature effects.

Product features and capabilities include:

- Remote mount seals can be used for high temperature applications.
- Remote mount seals are used on the low pressure side of the transmitter for tuned-system assemblies that can be used for DP measurements in closed or pressurized tank applications.
- Variety of process connections.
- Quantified performance for the entire transmitter/seal assembly (QZ option).

Specification and selection of product materials, options, or components must be made by the purchaser of the equipment.

A.2.1 Rosemount 1199 Remote Mount Seal

The Rosemount 1199 Remote Mount Seal also requires specification of a Rosemount pressure transmitter. See the appropriate product data sheet for the desired transmitter and include the option indicated in [Table A-3](#) for the configuration desired.

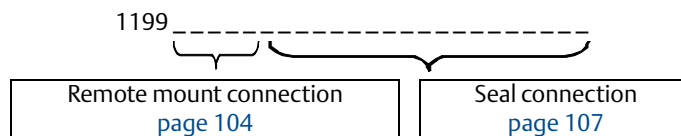
When ordering Rosemount 1199 Direct and Remote Mount Seals, make sure to add the correct seal system ordering code to the transmitter or gage model.

Table A-3. Direct Mount Seal Attach To Code Per Transmitter or Gage Model

Rosemount model	Two seals	One seal
3051S_C	B12	B11
3051C	S2	S1
2051C	S2	S1
3051S_T	N/A	B11
3051T, 3051HT, 2051T, 2088	N/A	S1
WPG	N/A	S1

A Rosemount 1199 Remote Mount Seal consists of two parts. First, specify the capillary model codes found on [page 104](#). Then, specify a remote seal found on [page 107](#).

Ordering codes



A.2.2 Capillary/fill fluid

Note

Use [Table A-4](#) on [page 104](#) for capillary type connections. Use [Table A-2](#) on [page 98](#) for direct mount type connections.

Table A-4. Rosemount 1199 Remote Mount Seal Systems Ordering Information

The starred offerings (★) represent the most common options and should be selected for best delivery. The non-starred offerings are subject to additional delivery lead time.

Rosemount Model	Product description			
1199	Seal system			
Connection type		Seal system	Seal location	
All coplanar devices (Rosemount 3051S_C, 3051C, and 2051C)				
W	Welded-repairable	One or two seal system	High side of transmitter	★
M	Welded-repairable	One or two seal system	Low side of transmitter	★
D	Welded-repairable	Two seal system	Balanced system - same seal on low and high side	★
R ⁽¹⁾	All welded	One seal system	High side of transmitter	★
T ⁽¹⁾	All welded	Two seal system	High side of transmitter	★
S ⁽¹⁾	All welded	Two seal system	Low side of transmitter	★
All In-line devices (Rosemount 3051S_T, 3051T, 3051HT, 2051T, 2088, and WPG)				
W	All welded	One seal system	N/A	★
Seal fill fluid		Specific gravity at 77 °F (25 °C)	Temperature limits ⁽²⁾	
D	Silicone 200	0.93	-49 to 401 °F (-45 to 205 °C)	★
F	Silicone 200 for vacuum applications	0.93	For use in vacuum applications below 14.7 psia (1 bar-a), refer to vapor pressure curves in Rosemount DP Level Fill Fluid Specification Technical Note .	★
J ⁽⁵⁾	Tri-Therm 300	0.795	-40 to 572 °F (-40 to 300 °C)	★
Q ⁽⁵⁾	Tri-Therm 300 for vacuum Applications	0.795	For use in vacuum applications below 14.7 psia (1 bar-a), refer to vapor pressure curves in Rosemount DP Level Fill Fluid Specification Technical Note .	★
L ⁽³⁾	Silicone 704	1.07	32 to 599 °F (0 to 315 °C)	★
C ⁽³⁾	Silicone 704 for vacuum applications	1.07	For use in vacuum applications below 14.7 psia (1 bar-a), refer to vapor pressure curves in Rosemount DP Level Fill Fluid Specification Technical Note .	★
R ⁽³⁾	Silicone 705	1.09	68 to 698 °F (20 to 370 °C)	★
V ⁽⁴⁾	Silicone 705 for vacuum applications	1.09	For use in vacuum applications below 14.7 psia (1 bar-a), refer to vapor pressure curves in Rosemount DP Level Fill Fluid Specification Technical Note .	★
A	Syltherm XLT	0.85	-157 to 293 °F (-105 to 145 °C)	★
H	Inert (Halocarbon)	1.85	-49 to 320 °F (-45 to 160 °C)	★
G ⁽⁵⁾⁽⁶⁾	Glycerin and water	1.13	5 to 203 °F (-15 to 95 °C)	★
N ⁽⁵⁾	Neobee M-20	0.92	5 to 437 °F (-15 to 225 °C)	★
P ⁽⁵⁾⁽⁶⁾	Propylene Glycol and water	1.02	5 to 203 °F (-15 to 95 °C)	★

Table A-4. Rosemount 1199 Remote Mount Seal Systems Ordering Information

The starred offerings (★) represent the most common options and should be selected for best delivery. The non-starred offerings are subject to additional delivery lead time.

Seal connection type/capillary ID, description		
B	0.03-in. (0,711 mm) ID	★
C	0.04-in. (1,092 mm) ID	★
D	0.075-in. (1,905 mm) ID	★
E ⁽⁷⁾	0.03-in. (0,711 mm) ID, PVC coated with closed end	★
F ⁽⁷⁾	0.04-in. (1,092 mm) ID, PVC coated with closed end	★
G ⁽⁷⁾	0.075-in. (1,905 mm) ID, PVC coated with closed end	★
H	0.03-in. (0,711 mm) ID, 4-in. support tube	★
J	0.04-in. (1,092 mm) ID, 4-in. support tube	★
K	0.075-in. (1,905 mm) ID, 4-in. support tube	★
M ⁽⁷⁾	0.03-in. (0,711 mm) ID, PVC coated, 4-in. support tube with closed end	★
N ⁽⁷⁾	0.04-in. (1,092 mm) ID, PVC coated, 4-in. support tube with closed end	★
P ⁽⁷⁾	0.075-in. (1,905 mm) ID, PVC PVC coated, 4-in. support tube with closed end	★
Capillary length ⁽⁸⁾		
01	1 ft. (0,3 m)	★
05	5 ft. (1,5 m)	★
10	10 ft. (3,0 m)	★
15	15 ft. (4,5 m)	★
20	20 ft. (6,1 m)	★
51	1.6 ft. (0,5 m)	★
52	3.3 ft. (1,0 m)	★
53	4.9 ft. (1,5 m)	★
54	6.6 ft. (2,0 m)	★
55	8.2 ft. (2,5 m)	★
56	9.8 ft. (3,0 m)	★
57	11.5 ft. (3,5 m)	★
58	13.1 ft. (4,0 m)	★
59	16.4 ft. (5,0 m)	★
60	19.7 ft. (6,0 m)	★
25	25 ft. (7,6 m)	
30	30 ft. (9,1 m)	
35	35 ft. (10,7 m)	
40	40 ft. (12,2 m)	
45	45 ft. (13,7 m)	
50	50 ft. (15,2 m)	








Table A-4. Rosemount 1199 Remote Mount Seal Systems Ordering Information

The starred offerings (★) represent the most common options and should be selected for best delivery. The non-starred offerings are subject to additional delivery lead time.





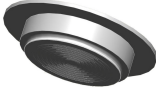


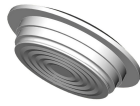

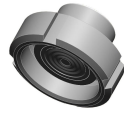
61	23 ft. (7,0 m)	
62	26.2 ft. (8,0 m)	
63	29.5 ft. (9,0 m)	
64	32.8 ft. (10,0 m)	
65	36.1 ft. (11,0 m)	
66	39.4 ft. (12,0 m)	
67	42.6 ft. (13,0 m)	
68	45.9 ft. (14,0 m)	
69	49.2 ft. (15,0 m)	

1. All welded system connection types require either a 316L SST or alloy C-276 isolating diaphragm in the pressure transmitter model codes.
2. At ambient pressure of 14.7 psia (1 bar-a) and ambient temperature of 70 °F and must be further derated if ambient, temperature exceeds 70 °F (21 °C).
3. Only available with seal connection type/capillary ID, description codes C, D, F, G, J, K, N, and P.
4. Only available with seal connection type/capillary ID, description codes D, G, K, and P.
5. This is a food grade fill fluid.
6. Not suitable for vacuum applications.
7. PVC coating should not be exposed to temperatures above 212 °F (100 °C) to avoid the possibility of thermal breakdown.
8. For Submersible Seal TSM and FSM models, refer to the Rosemount 1199 Submersible Seal [Product Data Sheet](#).


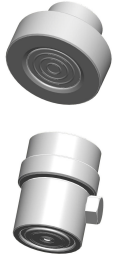



Continue specifying a completed model number by choosing a remote seal type below:
The starred offerings (★) represent the most common options and should be selected for best delivery. The non-starred offerings are subject to additional delivery lead time.

Flanged seal assemblies		Process connections	
	FFW flush flanged seal	2-in./DN 50/50A 3-in./DN 80/80A 4-in./DN 100/100A	★
	RFW flanged seal	1/2-in./DN 15 3/4-in. 1-in./DN 25/25A 1 1/2-in./DN 40/40A	★
	EFW extended flanged seal	1 1/2-in./DN 40/40A 2-in./DN 50 50A 3-in./headbox/DN 80/80A 4-in./headbox/DN100/100A	★
	PFW pancake seal	2-in./DN50 3-in./DN 80	★
	FCW flush flanged seal – RTJ gasket surface	2-in. 3-in.	
	RCW RTJ flanged seal	1/2-in. 3/4-in. 1-in. 1 1/2-in.	
	FUW and FVW flush flanged type seals	DN 50 DN 80	

The starred offerings (★) represent the most common options and should be selected for best delivery. The non-starred offerings are subject to additional delivery lead time.

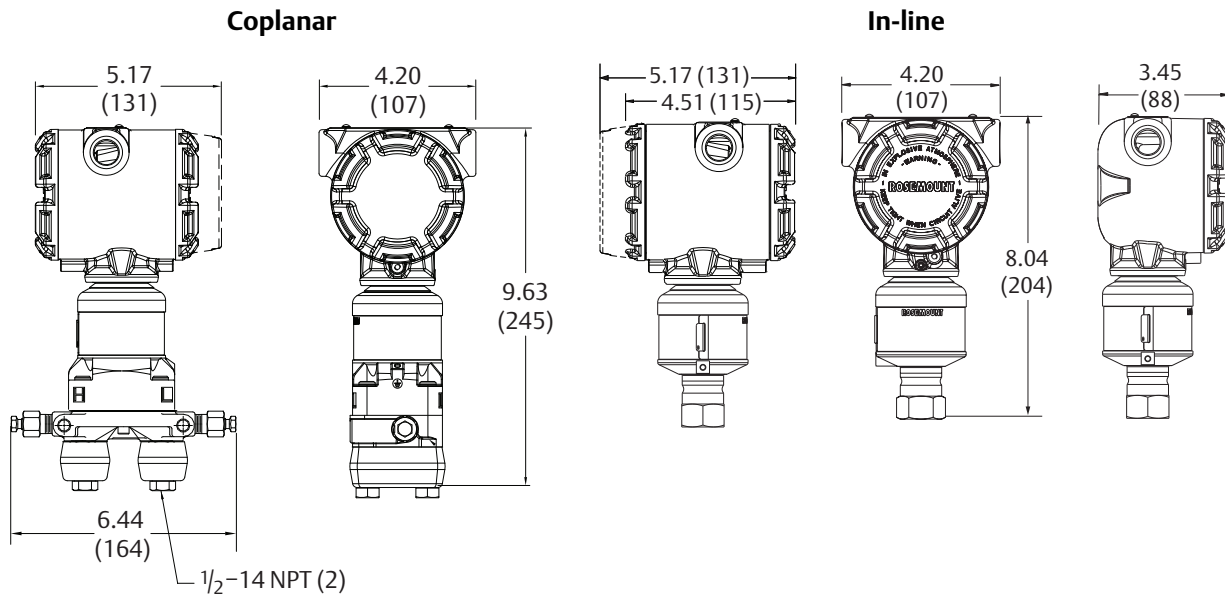
Threaded seal assemblies		Process connections	
	RTW threaded seal	1/4-18 NPT 3/8-18 NPT 1/2-14 NPT 3/4-14 NPT 1-11 1/2 NPT 1 1/4-11 1/2 NPT 1 1/2-11 1/2 NPT G 1/2 ADIN 16288 R 1/2 per ISO 7/1	★
	HTS male threaded seal	G1 G1 1/2 G2 1-11 1/2 NPT 1 1/2-11 1/2 NPT 2-11 1/2 NPT	
Hygienic seal assemblies			
	SCW hygienic Tri Clover style Tri Clamp seal	1 1/2-in. 2-in. 2 1/2-in. 3-in. 4-in.	★
	SSW hygienic tank spud seal	2-in. extension 6-in. extension	★
	STW hygienic thin wall tank spud seal	0.8-in. extension	
	EES hygienic flanged tank spud extended seal	DN 50 DN 80	
	VCS Tri Clamp in-line seal	1-in. 1 1/2-in. 2-in. 3-in. 4-in.	
	SVS VARIVENT compatible hygienic connection seal	Tuchenhagen VARIVENT Compatible	
	SHP hygienic Cherry-Burrell "I" line seal	2-in. 3-in.	
	SLS dairy process connection - female thread seal per DIN 11851	DN 40 DN 50	

The starred offerings (★) represent the most common options and should be selected for best delivery. The non-starred offerings are subject to additional delivery lead time.

Specialty seal assemblies			
	WSP saddle seal	2-in. 3-in. 4-in. or larger	
	UCP male threaded pipe mount seals and PMW paper mill sleeve seals	1 1/2-in. with threaded knurled nut 1-in. with cap screw retainer	
	CTW chemical tee seal	Retro-fit	
	TFS wafer style in-line seal	1-in./DN 25 1 1/2-in./DN 40 2-in./DN 50 3-in./DN 80 4-in./DN 100	
	WFW flow-thru flanged seal	1-in. 2-in. 3-in.	

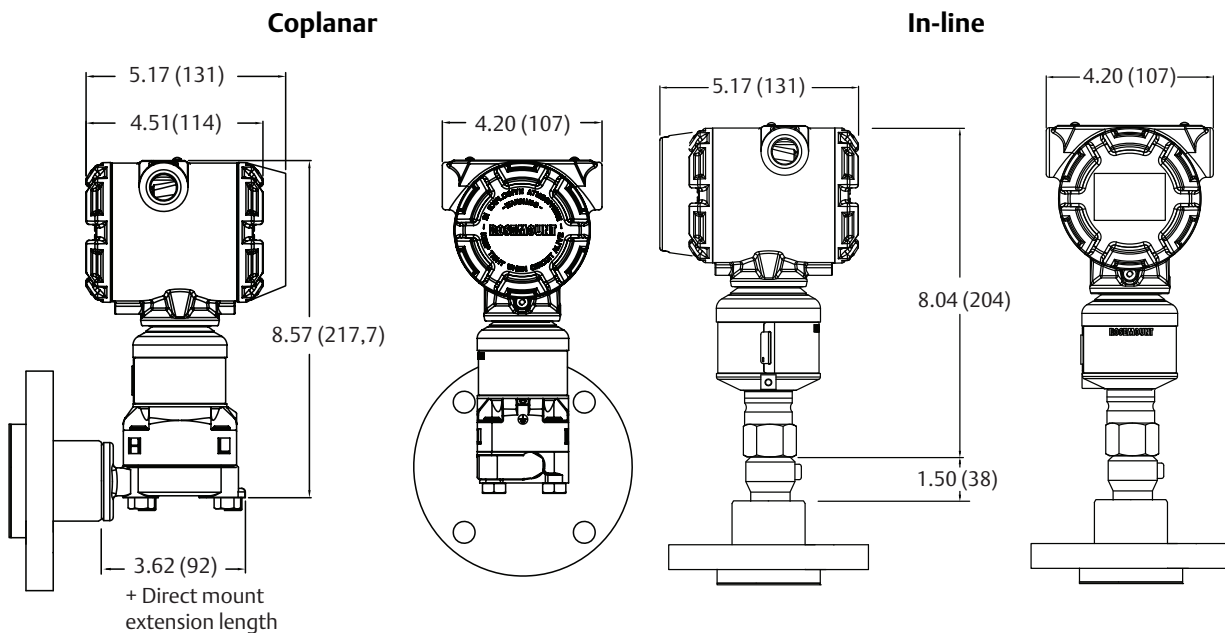
A.3 Dimensional drawings

Figure A-1. Rosemount 3051S ERS Measurement Transmitter



Dimensions are in inches (millimeters).

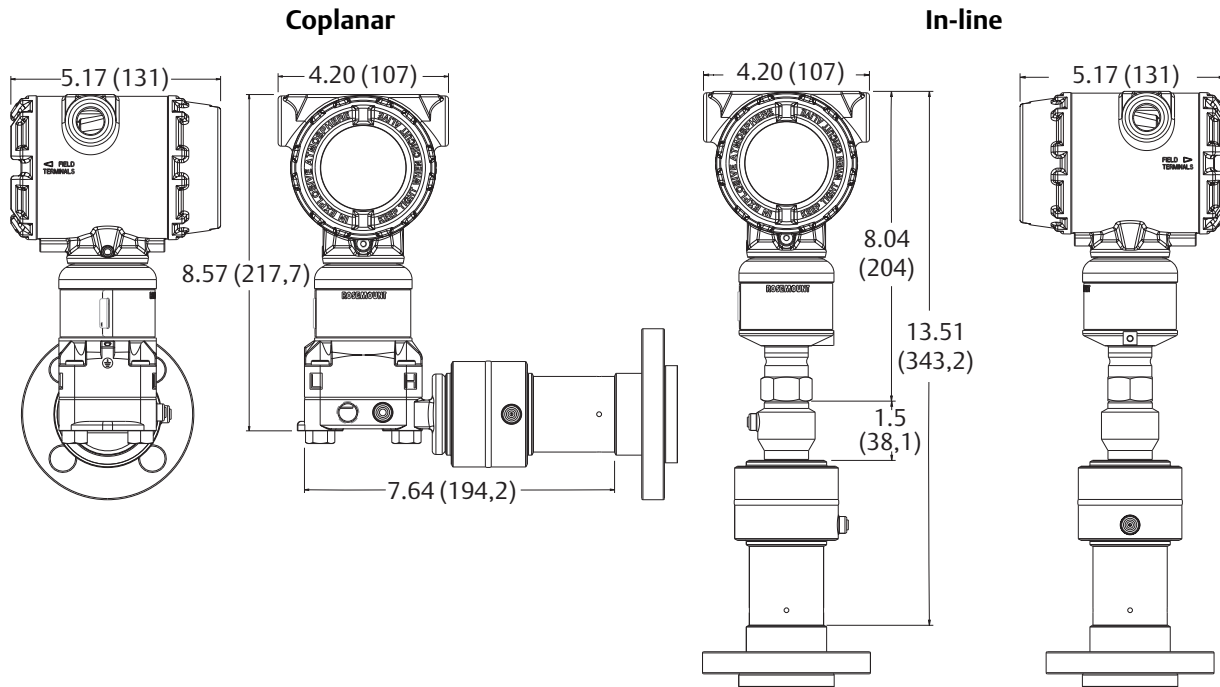
Figure A-2. Rosemount 3051S Scalable Level Transmitter with FF⁽¹⁾⁽²⁾



Dimensions are in inches (millimeters).

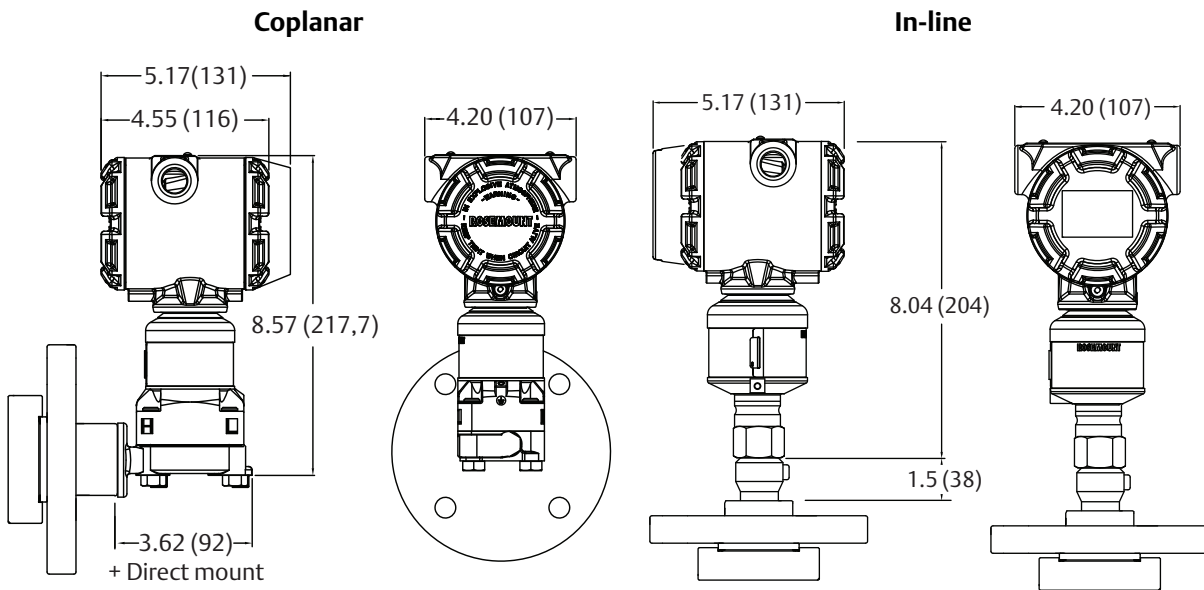
1. FF (FFW) seal dimensions and pressure ratings can be found on page 21.
2. Lower housing (flushing ring) is available with FFW style flange.

Figure A-3. Rosemount 3051S Scalable Level Transmitter with Rosemount Thermal Range Expander



Dimensions are in inches (millimeters).

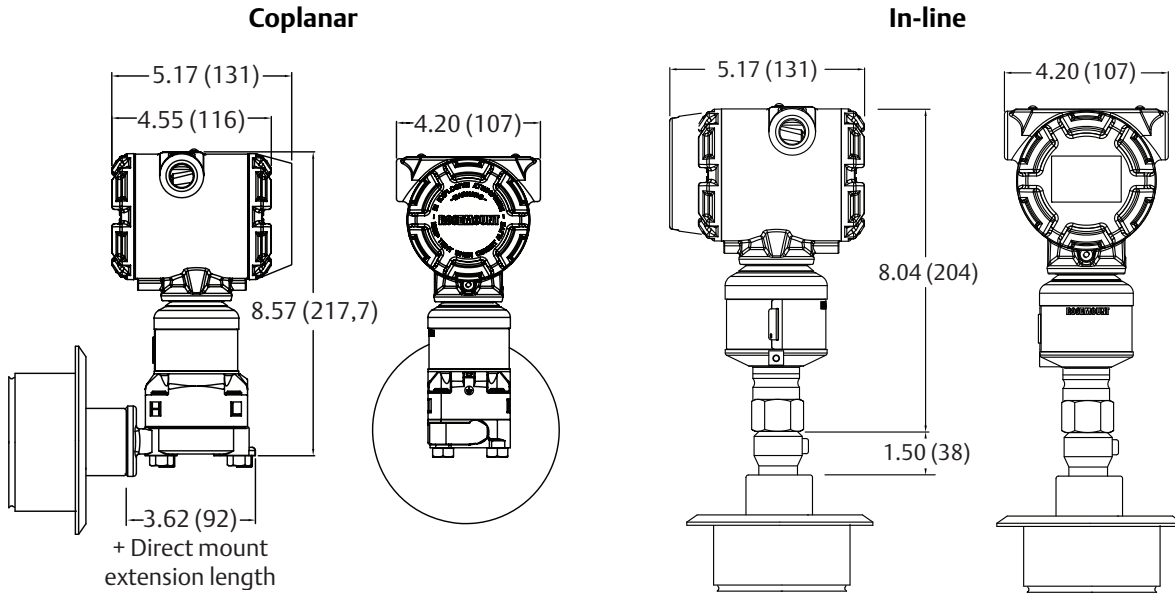
Figure A-4. Rosemount 3051S Scalable Level Transmitter with RF⁽¹⁾



Dimensions are in inches (millimeters).

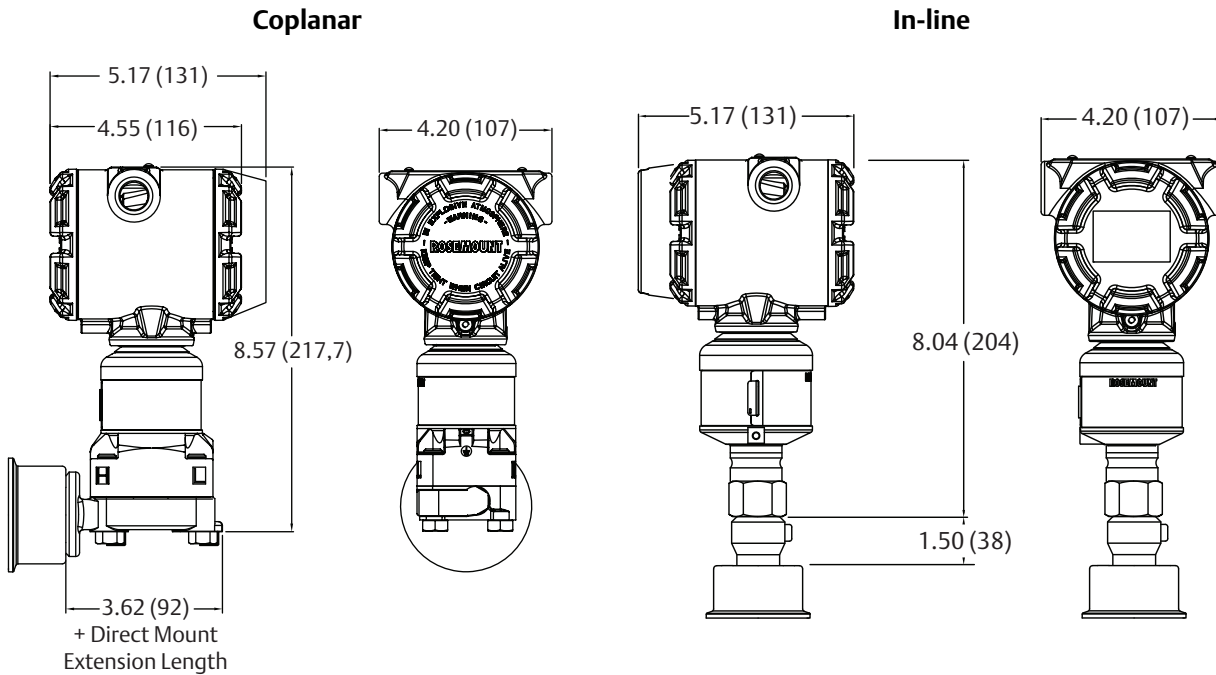
1. RF (RFW) seal dimensions and pressure ratings can be found on page 29.

Figure A-5. Rosemount 3051S Scalable Level Transmitter with SS⁽¹⁾



Dimensions are in inches (millimeters).

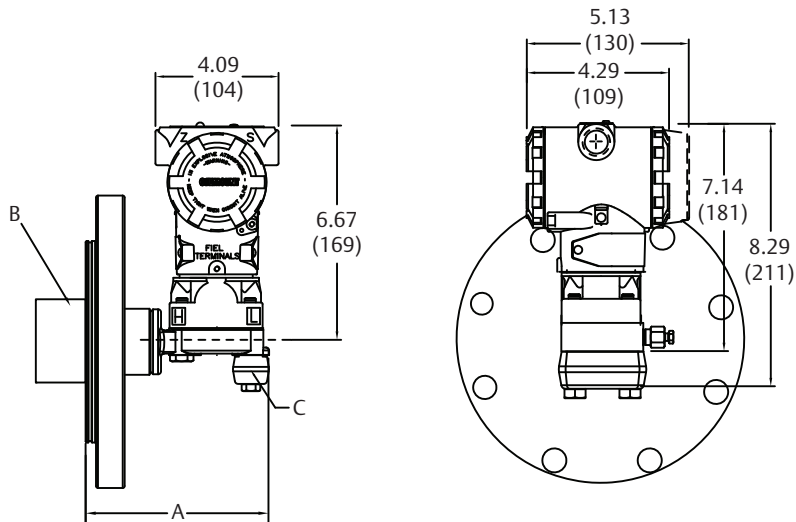
Figure A-6. Rosemount 3051S Scalable Level Transmitter with SC⁽²⁾



Dimensions are in inches (millimeters).

1. SS (SSW) seal dimensions and pressure ratings can be found on page 58.
2. SC (SCW) seal dimensions and pressure ratings can be found on page 56.

Figure A-7. Rosemount 3051L Level Transmitter with FF or EF Seal⁽¹⁾

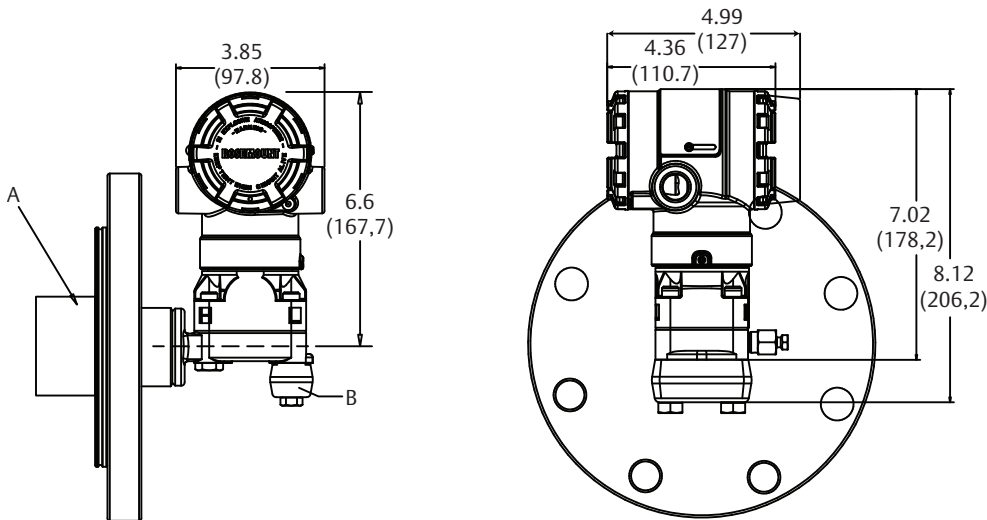


- A. Refer to Table A-5
 - B. 2-, 4-, or 6-in. extension (only available with 3- and 4-in. flange configurations)
 - C. Flange adapters (optional, differential configuration only)
- Dimensions are in inches (millimeters).

Table A-5. Transmitter Direct Mount Extension

Flange rating	Transmitter flange extension	Extension dimension ("A")
ANSI/ASME B16.5 Class 600	2-in.	7.65-in. (194,3 mm)
All others	0-in.	5.65-in. (143,5 mm)

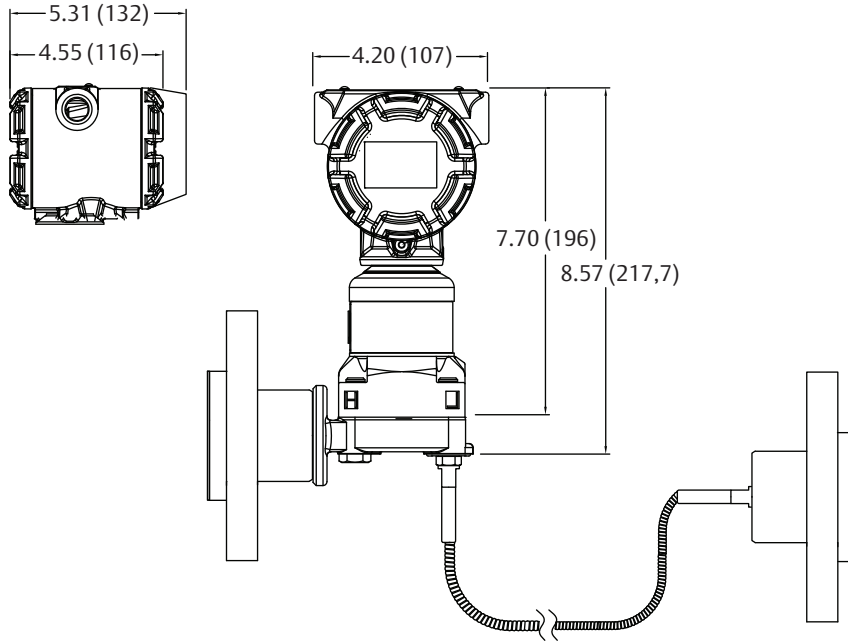
Figure A-8. Rosemount 2051L Level Transmitter with FF or EF Seal⁽¹⁾



- A. 2-, 4-, or 6-in. extension (only available with 3- and 4-in. flange configurations)
 - B. Flange adapters (optional, differential configuration only)
- Dimensions are in inches (millimeters).

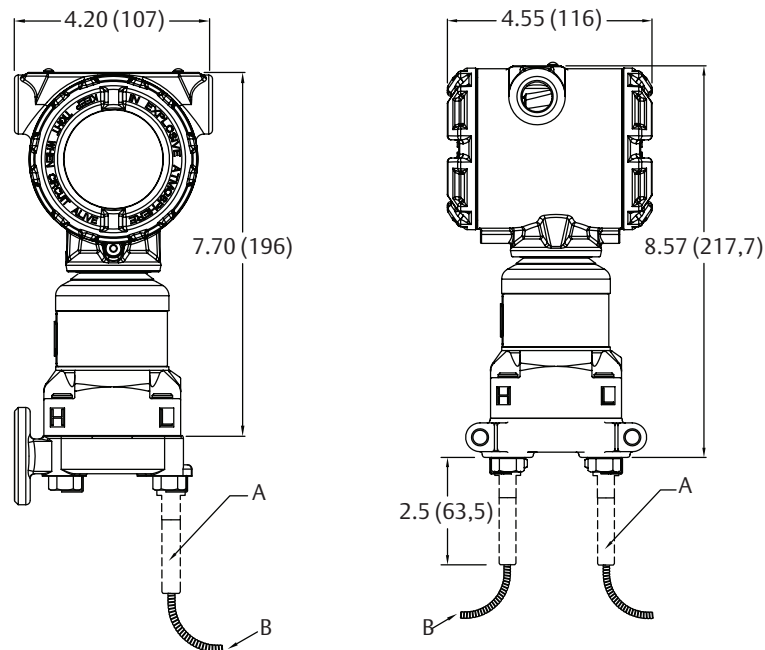
1. FF (FFW) and EF (EFW) seal and flange diameter dimensions can be viewed on page 21 and page 33.

Figure A-9. Tuned-System Assembly shown with Rosemount 3051S Scalable Level Transmitter⁽¹⁾⁽²⁾



Dimensions are in inches (millimeters).

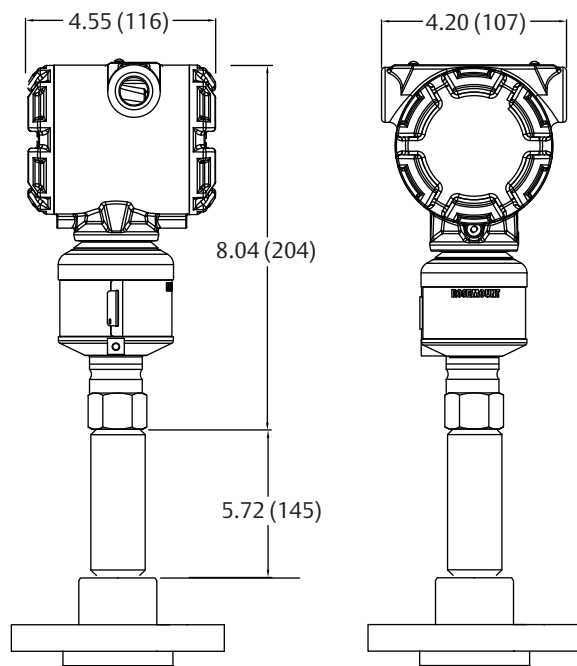
Figure A-10. Rosemount 1199 Remote Seal System Assembly shown with Rosemount 3051S Scalable Transmitter



A. Capillary connection only
B. Capillary connects to Rosemount 1199 Remote Seal
Dimensions are in inches (millimeters).

1. Tuned-system assemblies require specification of capillary length and addition Rosemount 1199 Remote Seal.
2. Tuned-system assemblies are available on all level transmitters.

Figure A-11. Thermal Optimizer (D5) with FFW



Dimensions are in inches (millimeters).

A.4 Spare parts

Table A-6. Flush Flanged (FFW) Lower Housings

Material	Size	Part number			
		One 1/4-in.	Two 1/4-in.	One 1/2-in.	Two 1/2-in.
316 SST	2-in.	DP0002-2111-S6	DP0002-2121-S6	DP0002-2112-S6	DP0002-2122-S6
	3-in.	DP0002-3111-S6	DP0002-3121-S6	DP0002-3112-S6	DP0002-3122-S6
	4-in./DN 100	DP0002-4111-S6	DP0002-4121-S6	DP0002-4112-S6	DP0002-4122-S6
	DN 50	DP0002-5111-S6	DP0002-5121-S6	DP0002-5112-S6	DP0002-5122-S6
	DN 80	DP0002-8111-S6	DP0002-8121-S6	DP0002-8112-S6	DP0002-8122-S6
Alloy C-276	2-in.	DP0002-2111-HC	DP0002-2121-HC	DP0002-2112-HC	DP0002-2122-HC
	3-in.	DP0002-3111-HC	DP0002-3121-HC	DP0002-3112-HC	DP0002-3122-HC
	4-in./DN 100	DP0002-4111-HC	DP0002-4121-HC	DP0002-4112-HC	DP0002-4122-HC
	DN 50	DP0002-5111-HC	DP0002-5121-HC	DP0002-5112-HC	DP0002-5122-HC
	DN 80	DP0002-8111-HC	DP0002-8121-HC	DP0002-8112-HC	DP0002-8122-HC

Table A-6. Flush Flanged (FFW) Lower Housings

Material	Size	Part number			
		One 1/4-in.	Two 1/4-in.	One 1/2-in.	Two 1/2-in.
Alloy 400	2-in.	DP0002-2111-M4	DP0002-2121-M4	DP0002-2112-M4	DP0002-2122-M4
	3-in.	DP0002-3111-M4	DP0002-3121-M4	DP0002-3112-M4	DP0002-3122-M4
	4-in./DN 100	DP0002-4111-M4	DP0002-4121-M4	DP0002-4112-M4	DP0002-4122-M4
	DN 50	DP0002-5111-M4	DP0002-5121-M4	DP0002-5112-M4	DP0002-5122-M4
	DN 80	DP0002-8111-M4	DP0002-8121-M4	DP0002-8112-M4	DP0002-8122-M4

Table A-7. Gaskets for Flush Flanged (FFW) Lower Housings

Material	Size	Part number			
		Thermo-Tork® 9000	Virgin PTFE	GHB GRAFOIL®	Gylon 3510
316 SST	2-in.	DP0007-0201-TT	DP0007-0201-TF	DP0007-0201-GF	DP0007-0201-GY
	3-in.	DP0007-0301-TT	DP0007-0301-TF	DP0007-0301-GF	DP0007-0301-GY
	4-in./DN 100	DP0007-0401-TT	DP0007-0401-TF	DP0007-0401-GF	DP0007-0401-GY
	DN 50	DP0007-0601-TT	DP0007-0601-TF	DP0007-0601-GF	DP0007-0601-GY
	DN 80	DP0007-0801-TT	DP0007-0801-TF	DP0007-0801-GF	DP0007-0801-GY

Table A-8. Alignment Clamps for Flush Flanged (FFW) Lower Housings

	Size	Part number
ANSI/JIS	2-in.	DP0127-2000-S1
	3-in.	DP0127-3000-S1
	4-in.	DP0127-4000-S1
DIN	DN 50	DP0127-5000-S1
	DN 80	DP0127-8000-S1
	DN 100	DP0127-4000-S1

Table A-9. Plugs for Flush Flanged (FFW) Lower Housings

Material	1/4-in.	1/2-in.
SST	C-502460502	C-502460504
Alloy C-276	C-502460602	C-502460604

Table A-10. Pancake (PFW) Lower Housings

Material	Size	Part number			
		One 1/4-in.	Two 1/4-in.	One 1/2-in.	Two 1/2-in.
316 SST	2-in.	DP0002-2111-S6	DP0002-2121-S6	DP0002-2112-S6	DP0002-2122-S6
	3-in.	DP0002-3111-S6	DP0002-3121-S6	DP0002-3112-S6	DP0002-3122-S6
	4-in./DN 100	DP0002-4111-S6	DP0002-4121-S6	DP0002-4112-S6	DP0002-4122-S6
	DN 50	DP0002-5111-S6	DP0002-5121-S6	DP0002-5112-S6	DP0002-5122-S6
	DN 80	DP0002-8111-S6	DP0002-8121-S6	DP0002-8112-S6	DP0002-8122-S6
Alloy C-276	2-in.	DP0002-2111-HC	DP0002-2121-HC	DP0002-2112-HC	DP0002-2122-HC
	3-in.	DP0002-3111-HC	DP0002-3121-HC	DP0002-3112-HC	DP0002-3122-HC
	4-in./DN 100	DP0002-4111-HC	DP0002-4121-HC	DP0002-4112-HC	DP0002-4122-HC
	DN 50	DP0002-5111-HC	DP0002-5121-HC	DP0002-5112-HC	DP0002-5122-HC
	DN 80	DP0002-8111-HC	DP0002-8121-HC	DP0002-8112-HC	DP0002-8122-HC
Alloy 400	2-in.	DP0002-2111-M4	DP0002-2121-M4	DP0002-2112-M4	DP0002-2122-M4
	3-in.	DP0002-3111-M4	DP0002-3121-M4	DP0002-3112-M4	DP0002-3122-M4
	4-in./DN 100	DP0002-4111-M4	DP0002-4121-M4	DP0002-4112-M4	DP0002-4122-M4
	DN 50	DP0002-5111-M4	DP0002-5121-M4	DP0002-5112-M4	DP0002-5122-M4
	DN 80	DP0002-8111-M4	DP0002-8121-M4	DP0002-8112-M4	DP0002-8122-M4

Table A-11. Gaskets for Pancake (PFW) Lower Housings

Material	Size	Part number			
		Thermo-Tork 9000	Virgin PTFE	GHB GRAFOIL	Gylon 3510
316 SST	2-in.	DP0007-0201-TT	DP0007-0201-TF	DP0007-0201-GF	DP0007-0201-GY
	3-in.	DP0007-0301-TT	DP0007-0301-TF	DP0007-0301-GF	DP0007-0301-GY
	4-in./DN 100	DP0007-0401-TT	DP0007-0401-TF	DP0007-0401-GF	DP0007-0401-GY
	DN 50	DP0007-0601-TT	DP0007-0601-TF	DP0007-0601-GF	DP0007-0601-GY
	DN 80	DP0007-0801-TT	DP0007-0801-TF	DP0007-0801-GF	DP0007-0801-GY

Table A-12. Alignment Clamps for Pancake (PFW) Lower Housings

	Size	Part number
ANSI/JIS	2-in.	DP0127-2000-S1
	3-in.	DP0127-3000-S1
	4-in.	DP0127-4000-S1
DIN	DN 50	DP0127-5000-S1
	DN 80	DP0127-8000-S1
	DN 100	DP0127-4000-S1

Table A-13. Plugs for Pancake (PFW) Lower Housings

Material	1/4-in.	1/2-in.
SST	C502460502	C502460504
Alloy C-276	C502460602	C502460604

Table A-14. Remote Flanged (RFW) Lower Housings

Material	Size	Part number				
		No flushing connection	One 1/4-in.	Two 1/4-in.	One 1/2-in.	Two 1/2-in.
316 SST	1-in.	DP0004-1100-S6	DP0004-1111-S6	DP0004-1121-S6	DP0004-1112-S6	DP0004-1122-S6
	1 1/2-in.	DP0004-1600-S6	DP0004-1611-S6	DP0004-1621-S6	DP0004-1612-S6	DP0004-1622-S6
	DN 25	DP0004-1700-S6	DP0004-1711-S6	DP0004-1721-S6	DP0004-1712-S6	DP0004-1722-S6
	DN 40	DP0004-1900-S6	DP0004-1911-S6	DP0004-1921-S6	DP0004-1912-S6	DP0004-1922-S6
Alloy C-276	1-in.	DP0004-1100-HC	DP0004-1111-HC	DP0004-1121-HC	DP0004-1112-HC	DP0004-1122-HC
	1 1/2-in.	DP0004-1600-HC	DP0004-1611-HC	DP0004-1621-HC	DP0004-1612-HC	DP0004-1622-HC
	DN 25	DP0004-1700-HC	DP0004-1711-HC	DP0004-1721-HC	DP0004-1712-HC	DP0004-1722-HC
	DN 40	DP0004-1900-HC	DP0004-1911-HC	DP0004-1921-HC	DP0004-1912-HC	DP0004-1922-HC
Carbon steel	1-in.	DP0004-1100-Z1	DP0004-1111-Z1	DP0004-1121-Z1	DP0004-1112-Z1	DP0004-1122-Z1
	1 1/2-in.	DP0004-1600-Z1	DP0004-1611-Z1	DP0004-1621-Z1	DP0004-1612-Z1	DP0004-1622-Z1
	DN 25	DP0004-1700-Z1	DP0004-1711-Z1	DP0004-1721-Z1	DP0004-1712-Z1	DP0004-1722-Z1
	DN 40	DP0004-1900-Z1	DP0004-1911-Z1	DP0004-1921-Z1	DP0004-1912-Z1	DP0004-1922-Z1
Alloy 400	1-in.	DP0004-1100-M4	DP0004-1111-M4	DP0004-1121-M4	DP0004-1112-M4	DP0004-1122-M4
	1 1/2-in.	DP0004-1600-M4	DP0004-1611-M4	DP0004-1621-M4	DP0004-1612-M4	DP0004-1622-M4
	DN 25	DP0004-1700-M4	DP0004-1711-M4	DP0004-1721-M4	DP0004-1712-M4	DP0004-1722-M4
	DN 40	DP0004-1900-M4	DP0004-1911-M4	DP0004-1921-M4	DP0004-1912-M4	DP0004-1922-M4

Table A-15. Gaskets for Remote Flanged (RFW) Lower Housings

Material	Size	Part number				
		C4401 Aramid fiber	PTFE	Barium sulfate filled PTFE	GHB GRAFOIL	Ethylene propylene
316 SST	1-in.	DP0007-2401-K4	DP0007-2401-TF	DP0007-2401-GY	DP0007-2401-GF	DP0007-2401-ER
	1 1/2-in.	DP0007-2401-K4	DP0007-2401-TF	DP0007-2401-GY	DP0007-2401-GF	DP0007-2401-ER
	DN 25	DP0007-2401-K4	DP0007-2401-TF	DP0007-2401-GY	DP0007-2401-GF	DP0007-2401-ER
	DN 40	DP0007-2401-K4	DP0007-2401-TF	DP0007-2401-GY	DP0007-2401-GF	DP0007-2401-ER

Table A-16. Plugs for Remote Flanged (RFW) Lower Housings

Material	1/4-in.	1/2-in.
SST	C502460502	C502460504
Alloy C-276	C502460602	C502460604

Table A-17. Threaded (RTW) Lower Housings

Material	Size	Part number				
		No flushing connection	One 1/4-in.	Two 1/4-in.	One 1/2-in.	Two 1/2-in.
316 SST	1/4-18 NPT	DP0070-1101-S6	DP0070-1112-S6	DP0070-1122-S6	DP0070-111A-S6	DP0070-112A-S6
	3/8-18 NPT	DP0070-1201-S6	DP0070-1212-S6	DP0070-1222-S6	DP0070-121A-S6	DP0070-122A-S6
	1/2-14 NPT	DP0070-1301-S6	DP0070-1312-S6	DP0070-1322-S6	DP0070-131A-S6	DP0070-132A-S6
	3/4-14 NPT	DP0070-1401-S6	DP0070-1412-S6	DP0070-1422-S6	DP0070-141A-S6	DP0070-142A-S6
	1-11.5 NPT	DP0070-1501-S6	DP0070-1512-S6	DP0070-1522-S6	DP0070-151A-S6	DP0070-152A-S6
	1 1/4-11.5 NPT	DP0070-1601-S6	N/A	N/A	N/A	N/A
	1 1/2-11.5 NPT	DP0070-1701-S6	N/A	N/A	N/A	N/A
	G 1/2A DIN 16288	DP0070-1901-S6	DP0070-1912-S6	DP0070-1922-S6	DP0070-191A-S6	DP0070-192A-S6
Alloy C-276	1/4-18 NPT	DP0070-1101-HC	DP0070-1112-HC	DP0070-1122-HC	DP0070-111A-HC	DP0070-112A-HC
	3/8-18 NPT	DP0070-1201-HC	DP0070-1212-HC	DP0070-1222-HC	DP0070-121A-HC	DP0070-122A-HC
	1/2-14 NPT	DP0070-1301-HC	DP0070-1312-HC	DP0070-1322-HC	DP0070-131A-HC	DP0070-132A-HC
	3/4-14 NPT	DP0070-1401-HC	DP0070-1412-HC	DP0070-1422-HC	DP0070-141A-HC	DP0070-142A-HC
	1-11.5 NPT	DP0070-1501-HC	DP0070-1512-HC	DP0070-1522-HC	DP0070-151A-HC	DP0070-152A-HC
	1 1/4-11.5 NPT	DP0070-1601-HC	N/A	N/A	N/A	N/A
	1 1/2-11.5 NPT	DP0070-1701-HC	N/A	N/A	N/A	N/A
	G 1/2A DIN 16288	DP0070-1901-HC	DP0070-1912-HC	DP0070-1922-HC	DP0070-191A-HC	DP0070-192A-HC
Carbon Steel	1/4-18 NPT	DP0070-1101-Z1	DP0070-1112-Z1	DP0070-1122-Z1	DP0070-111A-Z1	DP0070-112A-Z1
	3/8-18 NPT	DP0070-1201-Z1	DP0070-1212-Z1	DP0070-1222-Z1	DP0070-121A-Z1	DP0070-122A-Z1
	1/2-14 NPT	DP0070-1301-Z1	DP0070-1312-Z1	DP0070-1322-Z1	DP0070-131A-Z1	DP0070-132A-Z1
	3/4-14 NPT	DP0070-1401-Z1	DP0070-1412-Z1	DP0070-1422-Z1	DP0070-141A-Z1	DP0070-142A-Z1
	1-11.5 NPT	DP0070-1501-Z1	DP0070-1512-Z1	DP0070-1522-Z1	DP0070-151A-Z1	DP0070-152A-Z1
	1 1/4-11.5 NPT	DP0070-1601-Z1	N/A	N/A	N/A	N/A
	1 1/2-11.5 NPT	DP0070-1701-Z1	N/A	N/A	N/A	N/A
	G 1/2A DIN 16288	DP0070-1901-Z1	DP0070-1912-Z1	DP0070-1922-Z1	DP0070-191A-Z1	DP0070-192A-Z1
Alloy 400	1/4-18 NPT	DP0070-1101-M4	DP0070-1112-M4	DP0070-1122-M4	DP0070-111A-M4	DP0070-112A-M4
	3/8-18 NPT	DP0070-1201-M4	DP0070-1212-M4	DP0070-1222-M4	DP0070-121A-M4	DP0070-122A-M4
	1/2-14 NPT	DP0070-1301-M4	DP0070-1312-M4	DP0070-1322-M4	DP0070-131A-M4	DP0070-132A-M4
	3/4-14 NPT	DP0070-1401-M4	DP0070-1412-M4	DP0070-1422-M4	DP0070-141A-M4	DP0070-142A-M4
	1-11.5 NPT	DP0070-1501-M4	DP0070-1512-M4	DP0070-1522-M4	DP0070-151A-M4	DP0070-152A-M4
	1 1/4-11.5 NPT	DP0070-1601-M4	N/A	N/A	N/A	N/A
	1 1/2-11.5 NPT	DP0070-1701-M4	N/A	N/A	N/A	N/A
	G 1/2A DIN 16288	DP0070-1901-M4	DP0070-1912-M4	DP0070-1922-M4	DP0070-191A-M4	DP0070-192A-M4

Table A-18. Gaskets for Threaded (RTW) Lower Housings

Size	Part number						
	C4401 Aramid Fiber	PTFE	Barium Sulfate filled PTFE	GHB GRAFOIL	Ehtylene Propylene	Alloy 400	Alloy C-276
2500 psi MWP	DP0007-2401-K4	DP0007-2401-TF	DP0007-2401-GY	DP0007-2401-GF	DP0007-2401-ER	NA	NA
5000 psi MWP	DP0007-2401-K4	TBD	DP0007-2401-GY	DP0007-2401-GF	NA	NA	NA
10000 psi MWP	DP0007-2401-K4	NA	NA	NA	NA	DP0007-2403-M4	DP0007-2403-HC

Table A-19. Plugs for Threaded (RTW) Lower Housings

Material	1/4-in.	1/2-in.
SST	C502460502	C502460504
Alloy C-276	C502460602	C502460604

Table A-20. Sanitary Tank Spud Seal (SSW) Parts

Part description	Part number
Sanitary tank spud	
2-in. extension	01199-0061-0001
6-in. extension	01199-0061-0002
Sanitary tank spud plug	
2-in. extension	01199-0552-0001
6-in. extension	01199-0552-0002
Clamp	01199-0526-0002
Buna N O-ring	C103750175-0341
Viton O-ring	C502790075-0341
Ethylene Propylene O-ring	C531850070-0341

Table A-21. Sanitary Tri Clamp Seal (SCW and VCS) Parts

Part description	Part number
Buna N gasket	
3/4-in.	01199-0035-0105
1 1/2-in.	01199-0035-0115
2-in.	01199-0035-0120
2 1/2-in.	01199-0035-0125
3-in.	01199-0035-0130
4-in.	01199-0035-0140

Table A-22. Sanitary Thin Wall Tank Spud Seal (STW) Parts

Part description	Part number
Thin wall spud	01199-0073-0001
Clamp	01199-0526-0004
Ethylene Propylene O-ring	C531850070-0336

Table A-23. Sanitary Pipe Mount Seal (UCP) and Sleeve Seal (PMW) Parts

Part description	Part number
PTFE gasket (package of 12)	02088-0078-0001
316 SST weld spud (for UCP)	02088-0295-0003
316 SST plug/heat sink (for UCP)	02088-0196-0001
316 SST weld spud (for PMW)	02088-0285-0001

Appendix B Product Certifications

Rosemount 3051S/3051S ERS	page 121
Rosemount 3051S Wireless	page 130
Rosemount 3051	page 133
Rosemount 2051	page 141
Rosemount 3051 Wireless	page 148
Rosemount 2051 Wireless	page 150

B.1 Rosemount 3051S/3051S ERS

Rev 1.12

B.1.1 European Directive Information

A copy of the EU Declaration of Conformity can be found at the end of the Quick Start Guide. The most recent revision of the EU Declaration of Conformity can be found at Emerson.com/Rosemount.

B.1.2 Ordinary Location Certification

As standard, the transmitter has been examined and tested to determine that the design meets the basic electrical, mechanical, and fire protection requirements by FM Approvals, a nationally recognized test laboratory (NRTL) as accredited by the Federal Occupational Safety and Health Administration (OSHA).

B.1.3 Installing Equipment in North America

The US National Electrical Code® (NEC) and the Canadian Electrical Code (CEC) permit the use of Division marked equipment in Zones and Zone marked equipment in Divisions. The markings must be suitable for the area classification, gas, and temperature class. This information is clearly defined in the respective codes.

B.1.4 USA

- E5** FM Explosionproof (XP) and Dust-Ignitionproof (DIP)
Certificate: FM16US0090
Standards: FM Class 3600 – 2011,
FM Class 3615 – 2006,
FM Class 3616-2011,
FM Class 3810 – 2005,
ANSI/NEMA 250 – 2003
Markings: XP CL I, DIV 1, GP B, C, D; DIP CL II, DIV 1, GP E, F, G; CL III; T5(-50 °C ≤ T_a ≤ +85 °C);
Factory Sealed; Type 4X
- I5** FM Intrinsic Safety (IS) and Nonincendive (NI)
Certificate: FM16US0089X
Standards: FM Class 3600 – 2011,
FM Class 3610 – 2010,
FM Class 3611 – 2004,
FM Class 3810 – 2005,
NEMA 250 – 2003
Markings: IS CL I, DIV 1, GP A, B, C, D; CL II, DIV 1, GP E, F, G; Class III; Class 1, Zone 0 AEx ia IIC T4; NI CL 1, DIV 2, GP A, B, C, D;
T4(-50 °C ≤ T_a ≤ +70 °C) [HART];
T4(-50 °C ≤ T_a ≤ +60 °C) [Fieldbus];
when connected per Rosemount™ drawing 03151-1006; Type 4X

Special Condition for Safe Use (X):

1. The Rosemount 3051S/3051S-ERS Pressure Transmitter contains aluminum and is considered to constitute a potential risk of ignition by impact or friction. Care must be taken into account during installation and use to prevent impact and friction.

Note

Transmitters marked with NI CL 1, DIV 2 can be installed in Division 2 locations using general Division 2 wiring methods or Nonincendive Field Wiring (NIFW). See Drawing 03151-1006.

IE FM FISCO
Certificate: FM16US0089X
Standards: FM Class 3600 – 2011,
FM Class 3610 – 2010,
FM Class 3611 – 2004,
FM Class 3810 – 2005,
NEMA 250 – 2003
Markings: IS CL I, DIV 1, GP A, B, C, D;
T4(-50 °C ≤ T_a ≤ +60 °C); when connected
per Rosemount drawing 03151-1006; Type
4X

Special Condition for Safe Use (X):

1. The Rosemount 3051S/3051S-ERS Pressure Transmitter contains aluminum and is considered to constitute a potential risk of ignition by impact or friction. Care must be taken into account during installation and use to prevent impact and friction.

B.1.5 Canada

E6 CSA Explosionproof, Dust-Ignitionproof, and Division 2
Certificate: 143113
Standards: CAN/CSA C22.2 No. 0-10,
CSA Std C22.2 No. 25-1966,
CSA Std C22.2 No. 30-M1986,
CAN/CSA C22.2 No. 94-M91,
CSA Std C22.2 No. 142-M1987,
CSA Std C22.2 No. 213-M1987,
ANSI/ISA 12.27.01-2003,
CSA Std C22.2 No. 60529:05
Markings: Explosionproof Class I, Division 1, Groups B, C, D; Dust-Ignitionproof Class II, Division 1, Groups E, F, G; Class III; suitable for Class I, Zone 1, Group IIB+H2, T5; suitable for Class I, Division 2, Groups A, B, C, D; suitable for Class I, Zone 2, Group IIC, T5; when connected per Rosemount drawing 03151-1013; Type 4X

I6 CSA Intrinsically Safe
Certificate: 1143113
Standards: CAN/CSA C22.2 No. 0-10,
CSA Std C22.2 No. 30-M1986,
CAN/CSA C22.2 No. 94-M91,
CSA Std C22.2 No. 142-M1987,
CSA Std C22.2 No. 157-92,
ANSI/ISA 12.27.01-2003,
CSA Std C22.2 No. 60529:05
Markings: Intrinsically Safe Class I, Division 1; Groups A, B, C, D; suitable for Class 1, Zone 0, IIC, T3C; when connected per Rosemount drawing 03151-1016 [3051S] 03151-1313 [ERS]; Type 4X

IF CSA FISCO
Certificate: 1143113
Standards: CAN/CSA C22.2 No. 0-10,
CSA Std C22.2 No. 30-M1986,
CAN/CSA C22.2 No. 94-M91,
CSA Std C22.2 No. 142-M1987,
CSA Std C22.2 No. 157-92,
ANSI/ISA 12.27.01-2003,
CSA Std C22.2 No. 60529:05
Markings: FISCO Intrinsically Safe Class I, Division 1; Groups A, B, C, D; suitable for Class 1, Zone 0, IIC, T3C; when connected per Rosemount drawing 03151-1016 [3051S] 03151-1313 [ERS]; Type 4X

B.1.6 Europe

E1 ATEX Flameproof
Certificate: KEMA 00ATEX2143X
Standards: EN 60079-0:2012+A11:2013, EN
60079-1:2014, EN 60079-26:2015
Markings: Ⓜ II 1/2 G Ex db IIC T6...T4 Ga/Gb,
T6(-60 °C ≤ T_a ≤ +70 °C),
T5/T4(-60 °C ≤ T_a ≤ +80 °C)

Temperature class	Process temperature
T6	-60 °C to +70 °C
T5	-60 °C to +80 °C
T4	-60 °C to +120 °C

Special Conditions for Safe Use (X):

1. This device contains a thin wall diaphragm less than 1 mm thickness that forms a boundary between EPL Ga (process connection) and EPL Gb (all other parts of the equipment). The model code and datasheet are to be consulted for details of the diaphragm material. Installation, maintenance and use shall take into account the environmental conditions to which the diaphragm will be subjected. The manufacturer's instructions for installation and maintenance shall be followed in detail to assure safety during its expected lifetime.
2. Flameproof joints, are not intended for repair.
3. Non-standard paint options may cause risk from electrostatic discharge. Avoid installations that could cause electrostatic build-up on painted surfaces, and only clean the painted surfaces with a damp cloth. If paint is ordered through a special option code, contact the manufacturer for more information.
4. Appropriate cable, glands and plugs need to be suitable for a temperature of 5 °C greater than maximum specified temperature for location where installed.

I1 ATEX Intrinsic Safety

Certificate: BAS01ATEX1303X
 Standards: EN 60079-0:2012+A11:2013, EN 60079-11:2012
 Markings: Ex II 1 G Ex ia IIC T4 Ga,
 T4(-60 °C ≤ T_a ≤ +70 °C)

Model	U _i	I _i	P _i	C _i	L _i
SuperModule™	30 V	300 mA	1.0 W	30 nF	0
3051S...A; 3051SF...A; 3051SAL...C	30 V	300 mA	1.0 W	12 nF	0
3051S...F; 3051SF...F	30 V	300 mA	1.3 W	0	0
3051S ...A...M7, M8, or M9; 3051SF...A...M7, M8, or M9; 3051SAL...C... M7, M8, or M9	30 V	300 mA	1.0 W	12 nF	60 µH
3051SAL or 3051SAM	30 V	300 mA	1.0 W	12 nF	33 µH
3051SAL...M7, M8, or M9 3051SAM...M7, M8, or M9	30 V	300 mA	1.0 W	12 nF	93 µH
RTD Option for 3051SF	5 V	500 mA	0.63 W	N/A	N/A

Special Conditions for Safe Use (X):

1. The Rosemount 3051S Transmitters fitted with transient protection are not capable of withstanding the 500 V test as defined in Clause 6.3.13 of EN 60079-11:2012. This must be taken into account during installation.
2. The terminal pins of the Rosemount 3051S SuperModule must be provided with a degree of protection of at least IP20 in accordance with IEC/EN 60529.
3. The Rosemount 3051S enclosure may be made of aluminum alloy and given a protective polyurethane paint finish; however, care should be taken to protect it from impact or abrasion if located in a zone 0 area.

IA ATEX FISCO Field Device

Certificate: BAS01ATEX1303X
 Standards: EN 60079-0:2012+A11:2013,
 EN 60079-11:2012
 Markings: Ex II 1 G Ex ia IIC T4 Ga,
 T4(-60 °C ≤ T_a ≤ +70 °C)

Parameter	FISCO
Voltage U _i	17.5 V
Current I _i	380 mA
Power P _i	5.32 W
Capacitance C _i	0
Inductance L _i	0

Special Conditions for Safe Use (X):

1. The Rosemount 3051S Transmitters fitted with transient protection are not capable of withstanding the 500V test as defined in Clause 6.3.13 of EN 60079-11:2012. This must be taken into account during installation.
2. The terminal pins of the Rosemount 3051S SuperModule must be provided with a degree of protection of at least IP20 in accordance with IEC/EN 60529.
3. The Rosemount 3051S enclosure may be made of aluminum alloy and given a protective polyurethane paint finish; however, care should be taken to protect it from impact or abrasion if located in a zone 0 area.

ND ATEX Dust

Certificate: BAS01ATEX1374X
 Standards: EN 60079-0:2012+A11:2013, EN 60079-31:2009
 Markings: Ex II 1 D Ex ta IIIC T105 °C T₅₀₀ 95 °C Da,
 (-20 °C ≤ T_a ≤ +85 °C), V_{max} = 42.4 V

Special Conditions for Safe Use (X):

1. Cable entries must be used which maintain the ingress protection of the enclosure to at least IP66.
2. Unused cable entries must be filled with suitable blanking plugs which maintain the ingress protection of the enclosure to at least IP66.
3. Cable entries and blanking plugs must be suitable for the ambient temperature range of the apparatus and capable of withstanding a 7 J impact test.
4. The SuperModule(s) must be securely screwed in place to maintain the ingress protection of the enclosure(s).

N1 ATEX Type n

Certificate: BAS01ATEX3304X
 Standards: EN 60079-0:2012, EN 60079-15:2010
 Markings: Ⓜ II 3 G Ex nA IIC T5 Gc,
 (-40 °C ≤ T_a ≤ +85 °C), V_{max} = 45 V

Special Condition for Safe Use (X):

1. The equipment is not capable of withstanding the 500 V insulation test required by clause 6.5 of EN 60079-15:2010. This must be taken into account when installing the equipment.

Note

RTD Assembly is not included with the Rosemount 3051SFx Type n Approval.

B.1.7 International

E7 IECEx Flameproof and Dust

Certificate: IECEx KEM 08.0010X (Flameproof)
Standards: IEC 60079-0:2011, IEC 60079-1:2014, IEC 60079-26:2014
Markings: Ex db IIC T6...T4 Ga/Gb,
T6(-60 °C ≤ T_a ≤ +70 °C),
T5/T4(-60 °C ≤ T_a ≤ +80 °C)

Temperature class	Process temperature
T6	-60 °C to +70 °C
T5	-60 °C to +80 °C
T4	-60 °C to +120 °C

Special Conditions for Safe Use (X):

1. This device contains a thin wall diaphragm less than 1 mm thickness that forms a boundary between EPL Ga (process connection) and EPL Gb (all other parts of the equipment). The model code and datasheet are to be consulted for details of the diaphragm material. Installation, maintenance and use shall take into account the environmental conditions to which the diaphragm will be subjected. The manufacturer's instructions for installation and maintenance shall be followed in detail to assure safety during its expected lifetime.
2. Flameproof joints are not intended for repair.
3. Non-standard paint options may cause risk from electrostatic discharge. Avoid installations that could cause electrostatic build-up on painted surfaces, and only clean the painted surfaces with a damp cloth. If paint is ordered through a special option code, contact the manufacturer for more information.
4. Appropriate cable, glands and plugs need to be suitable for a temperature of 5 °C greater than maximum specified temperature for location where installed.

Certificate: IECEx BAS 09.0014X (Dust)
Standards: IEC 60079-0:2011, IEC 60079-31:2008
Markings: Ex ta IIIC T105 °C T₅₀₀ 95 °C Da,
(-20 °C ≤ T_a ≤ +85 °C), V_{max} = 42.4 V

Special Conditions for Safe Use (X):

1. Cable entries must be used which maintain the ingress protection of the enclosure to at least IP66.
 2. Unused cable entries must be filled with suitable blanking plugs which maintain the ingress protection of the enclosure to at least IP66.
 3. Cable entries and blanking plugs must be suitable for the ambient temperature range of the apparatus and capable of withstanding a 7J impact test.
 4. The Rosemount 3051S - SuperModule must be securely screwed in place to maintain the ingress protection of the enclosure.
- I7 IECEx Intrinsic Safety**
Certificate: IECEx BAS 04.0017X
Standards: IEC 60079-0: 2011, IEC 60079-11: 2011
Markings: Ex ia IIC T4 Ga, T4(-60 °C ≤ T_a ≤ +70 °C)

Model	U _i	I _i	P _i	C _i	L _i
SuperModule	30 V	300 mA	1.0 W	30 nF	0
3051S...A; 3051SF...A; 3051SAL...C	30 V	300 mA	1.0 W	12 nF	0
3051S...F; 3051SF...F	30 V	300 mA	1.3 W	0	0
3051S ...A...M7, M8, or M9; 3051SF...A...M7, M8, or M9; 3051SAL...C... M7, M8, or M9	30 V	300 mA	1.0 W	12 nF	60 μH
3051SAL or 3051SAM	30 V	300 mA	1.0 W	12 nF	33 μH
3051SAL...M7, M8, or M9 3051SAM...M7, M8, or M9	30 V	300 mA	1.0 W	12 nF	93 μH
RTD Option for 3051SF	5 V	500 mA	0.63 W	N/A	N/A

Special Conditions for Safe Use (X):

1. The Rosemount 3051S Transmitters fitted with transient protection are not capable of withstanding the 500 V test as defined in Clause 6.3.13 of IEC 60079-11:2011. This must be taken into account during installation.
2. The terminal pins of the Rosemount 3051S SuperModule must be provided with a degree of protection of at least IP20 in accordance with IEC/EN 60529.

- The Rosemount 3051S enclosure may be made of aluminum alloy and given a protective polyurethane paint finish; however, care should be taken to protect it from impact or abrasion if located in a zone 0 area.

I7 IECEx Intrinsic Safety – Group I - Mining

(I7 with Special A0259)

Certificate: IECEx TSA 14.0019X

Standards: IEC 60079-0:2011, IEC 60079-11:2011

Markings: Ex ia I Ma (-60 °C ≤ T_a ≤ +70 °C)

Model	U _i	I _i	P _i	C _i	L _i
SuperModule	30 V	300 mA	1.0 W	30 nF	0
3051S...A; 3051SF...A; 3051SAL...C	30 V	300 mA	1.0 W	12 nF	0
3051S...F; 3051SF...F	30 V	300 mA	1.3 W	0	0
3051S ...A...M7, M8, or M9; 3051SF...A...M7, M8, or M9; 3051SAL...C... M7, M8, or M9	30 V	300 mA	1.0 W	12 nF	60 μH
3051SAL or 3051SAM	30 V	300 mA	1.0 W	12 nF	33 μH
3051SAL...M7, M8, or M9 3051SAM...M7, M8, or M9	30 V	300 mA	1.0 W	12 nF	93 μH
RTD Option for 3051SF	5 V	500 mA	0.63 W	N/A	N/A

Special Conditions for Safe Use (X):

- If the apparatus is fitted with an optional 90 V transient suppressor, it is not capable of withstanding the 500 V insulation test required by clause 6.6.13 of IEC60079-11. This must be taken into account when installing the apparatus.
- It is a condition of safe use that the following parameters shall be taken into account during installation.
- It is a condition of manufacture that only the apparatus fitted with housings, junction boxes, covers and sensor module housings made out of stainless steel are used in Group I applications.

IG IECEx FISCO

Certificate: IECEx BAS 04.0017X

Standards: IEC 60079-0: 2011, IEC 60079-11: 2011

Markings: Ex ia IIC T4 Ga, T4(-60 °C ≤ T_a ≤ +70 °C)

Parameter	FISCO
Voltage U _i	17.5 V
Current I _i	380 mA
Power P _i	5.32 W
Capacitance C _i	0
Inductance L _i	0

Special Conditions for Safe Use (X):

- The Rosemount 3051S Transmitters fitted with transient protection are not capable of withstanding the 500V test as defined in Clause 6.3.13 of IEC 60079-11:2011. This must be taken into account during installation.
- The terminal pins of the Rosemount 3051S SuperModule must be provided with a degree of protection of at least IP20 in accordance with IEC/EN 60529.
- The Rosemount 3051S enclosure may be made of aluminum alloy and given a protective polyurethane paint finish; however, care should be taken to protect it from impact or abrasion if located in a zone 0 area.

IG IECEx Intrinsic Safety – Group I – Mining

(IG with Special A0259)

Certificate: IECEx TSA 04.0019X

Standards: IEC 60079-0:2011, IEC 60079-11:2011

Markings: FISCO FIELD DEVICE Ex ia I Ma,

(-60 °C ≤ T_a ≤ +70 °C)

Parameter	FISCO
Voltage U _i	17.5 V
Current I _i	380 mA
Power P _i	5.32 W
Capacitance C _i	0
Inductance L _i	0

Special Conditions for Safe Use (X):

- If the apparatus is fitted with optional 90 V transient suppressor, it is not capable of withstanding the 500 V insulation test required by Clause 6.3.13 of IEC60079-11. This must be taken into account when installing the apparatus.
- It is a condition of safe use that the above input parameters shall be taken into account during installation.

- It is a condition of manufacture that only the apparatus fitted with housing, covers and sensor module housing made out of stainless steel are used in Group I applications.

N7 IECEx Type n
Certificate: IECEx BAS 04.0018X
Standards: IEC 60079-0:2011, IEC 60079-15:2010
Markings: Ex nA IIC T5 Gc, ($-40\text{ °C} \leq T_a \leq +85\text{ °C}$)

Special Condition for Safe Use (X):

- The equipment is not capable of withstanding the 500 V insulation test required by clause 6.5 of IEC 60079-15:2010. This must be taken into account when installing the equipment.

B.1.8 Brazil

E2 INMETRO Flameproof
Certificate: UL-BR15.0393X
Standards: ABNT NBR IEC 60079-0:2008 + Corrigendum 1:2011, ABNT NBR IEC 60079-1:2009 + Corrigendum 1:2011, ABNT NBR IEC 60079-26:2008 + Corrigendum 1: 2008
Markings: Ex d IIC T* Ga/Gb, T6 ($-60\text{ °C} \leq T_a \leq +70\text{ °C}$), T5/T4 ($-60\text{ °C} \leq T_a \leq +80\text{ °C}$), IP66

Special Conditions for Safe Use (X):

- The device contains a thin wall diaphragm. Installation, maintenance and use shall take into account the environmental conditions to which the diaphragm will be subjected. The manufacturer's instructions for installation and maintenance shall be followed in detail to assure safety during its expected lifetime.
- For information on the dimensions of the flameproof joints, the manufacturer shall be contacted.

I2/IB INMETRO Intrinsic Safety/FISCO
Certificate: UL-BR 15.0392X
Standards: ABNT NBR IEC 60079-0:2008 + Corrigendum 1:2011, ABNT NBR IEC 60079-11:2009
Markings: Ex ia IIC T4 Ga, T4 ($-60\text{ °C} \leq T_a \leq +70\text{ °C}$), IP66

Special Condition for Safe Use (X):

- The Rosemount 3051S enclosure may be made of aluminium alloy and given a protective polyurethane paint finish; however, care should be taken to protect it from impact or abrasion if located in areas that requires EPL Ga.

Model	U _i	I _i	P _i	C _i	L _i
SuperModule	30 V	300 mA	1.0 W	30 nF	0
3051S...A; 3051SF...A; 3051SAL...C	30 V	300 mA	1.0 W	12 nF	0
3051S...F; 3051SF...F	30 V	300 mA	1.3 W	0	0
3051S...F...IB; 3051SF...F...IB	17.5V	380 mA	5.32 W	0	0
3051S...A...M7, M8, or M9; 3051SF...A...M7, M8, or M9; 3051SAL...C... M7, M8, or M9	30 V	300 mA	1.0 W	11.4 nF	60 μH
3051SAL or 3051SAM	30 V	300 mA	1.0 W	11.4 nF	33 μH
3051SAL...M7, M8, or M9 3051SAM...M7, M8, or M9	30 V	300 mA	1.0 W	11.4 nF	93 μH
RTD Option for 3051SF	5 V	500 mA	0.63 W	N/A	N/A

B.1.9 China

E3 China Flameproof and Dust Ignition-proof
Certificate: 3051S: GYJ16.1249X
3051SFx: GYJ16.1466X
3051S-ERS: GYJ15.1406X
Standards: 3051S: GB3836.1-2010, GB3836.2-2010, GB3836.20-2010, GB12476.1-2013, GB12476.5-2013
3051SFx: GB3836.1-2010, GB3836.2-2010, GB3836.20-2010, GB12476.1-2013, GB 12476.5-2013
3051S-ERS: GB3836.1-2010, GB3836.2-2010, GB3836.20-2010
Markings: 3051S: Ex d IIC T6...T4; Ex tD A20 T105 °C T₅₀₀ 95 °C; IP66
3051SFx: Ex d IIC T5/T6 Ga/Gb; DIP A20 T_A105 °C; IP66
3051S-ERS: Ex d IIC T4~T6 Ga/Gb

Special Conditions for Safe Use (X):

- Only the pressure transmitters, consisting of Rosemount 3051SC Series, 3051ST Series, 3051SL Series and 300S Series, are certified.
- Flameproof joints are not intended for repair.
- The ambient temperature range for the Rosemount 3051S and 3051SFx in a dust environment is $-20\text{ °C} \leq T_a \leq 85\text{ °C}$.

4. The relation between temperature class and maximum temperature of process medium is as follows:

Table B-1. Rosemount 3051S

Temperature class	Ambient temperature (°C)	Process temperature (°C)
T6	$-60^{\circ}\text{C} \leq T_a \leq +70^{\circ}\text{C}$	$-60^{\circ}\text{C} \leq T_a \leq +70^{\circ}\text{C}$
T5	$-60^{\circ}\text{C} \leq T_a \leq +80^{\circ}\text{C}$	$-60^{\circ}\text{C} \leq T_a \leq +80^{\circ}\text{C}$
T4	$-60^{\circ}\text{C} \leq T_a \leq +80^{\circ}\text{C}$	$-60^{\circ}\text{C} \leq T_a \leq +120^{\circ}\text{C}$

5. The earth connection facility in the enclosure should be connected reliably.
6. During installation, use and maintenance of transmitter, observe the warning “Don’t open the cover when the circuit is alive.”
7. During installation, there should be no mixture harm to flameproof housing.
8. Cable entry, certified by NEPSI with type of protection Ex d IIC in accordance with GB3836.1-2000 and GB3836.2-2000, should be applied when installation in hazardous location. 5 full threads should be in engagement when the cable entry is assembled onto the transmitter. When pressure transmitter is used in the presence of combustible dust, the ingress of protection of the cable entry should be IP66.
9. The diameter of cable should observe the instruction manual of cable entry. The compressing nut should be fastened. The aging of seal ring should be changed in time.
10. Maintenance should be done in non-hazardous location.
11. End users are not permitted to change any components inside.
12. When installation, use and maintenance of transmitter, observe following standards:
 GB3836.13-2003 “Electrical apparatus for explosive gas atmospheres Part 13: Repair and overhaul for apparatus used in explosive gas atmospheres”
 GB3836.15-2000 “Electrical apparatus for explosive gas atmospheres Part 15: Electrical installations in hazardous area (other than mines)”
 GB3836.16-2006 “Electrical apparatus for explosive gas atmospheres Part 16: Inspection and maintenance of electrical installation (other than mines)”
 GB50257-2014 “Code for construction and acceptance of electric device for explosion atmospheres and fire hazard electrical equipment installation engineering”
 GB15577-2007 “Safe regulation for explosive dust atmospheres”

GB12476.2-2010 “Electrical apparatus for use in the presence of combustible dust – Part 1-2: Electrical apparatus protected by enclosures and surface temperature limitation – Selection, installation and maintenance”

I3 China Intrinsic Safety

Certificate: 3051S: GYJ16.1250X
 [Mfg USA, China, Singapore]
 3051SFx: GYJ16.1465X
 [Mfg USA, China, Singapore]
 3051S-ERS: GYJ16.1248X
 [Mfg USA, China, Singapore]
 Standards: 3051S: GB3836.1-2010, GB3836.4-2010, GB3836.20-2010
 3051SFx: GB3836.1/4-2010, GB3836.20-2010, GB12476.1-2013, GB12476.5-2013
 3051S-ERS: GB3836.1-2010, GB3836.4-2010, GB3836.20-2010
 Markings: 3051S, 3051SFx: Ex ia IIC T4 Ga
 3051S-ERS: Ex ia IIC T4

Special Conditions for Safe Use (X):

1. Symbol “X” is used to denote specific conditions of use:
 For output code A and F: This apparatus is not capable of withstanding the 500 V r.m.s. insulation test required by Clause 6.4.12 of GB3836.4-2000.
2. The ambient temperature range is:

Output code	Ambient temperature
A	$-50^{\circ}\text{C} \leq T_a \leq +70^{\circ}\text{C}$
F	$-50^{\circ}\text{C} \leq T_a \leq +60^{\circ}\text{C}$

3. Intrinsically safe parameters:

Output code	Housing code	Display code	Maximum input voltage: U_i (V)	Maximum input current: I_i (mA)	Maximum input power: P_i (W)	Maximum internal parameters:	
						C_i (nF)	L_i (uH)
A	=00	/	30	300	1	38	0
A	≠00	/	30	300	1	11.4	2.4
A	≠00	M7/ M8/ M9	30	300	1	0	58.2
F	≠00	/	30	300	1.3	0	0
F FISCO	≠00	/	17.5	500	5.5	0	0

4. The product should be used with Ex-certified associated apparatus to establish explosion protection system that can be used in explosive gas atmospheres. Wiring and terminals should comply with the instruction manual of the product and associated apparatus.

5. The cable between this product and associated apparatus should be shielded cables (the cables must have insulated shield). The shield has to be grounded reliably in non-hazardous area.
6. The product complies to the requirements for FISCO field devices specified in IEC60079-27:2008. For the connection of an intrinsically safe circuit in accordance FISCO model, FISCO parameters of this product are as above.
7. End users are not permitted to change any components inside, but to settle the problem in conjunction with manufacturer to avoid damage to the product.
8. When installation, use and maintenance of this product, observe the following standards:
GB3836.13-2013 “Electrical apparatus for explosive gas atmospheres Part 13: Repair and overhaul for apparatus used in explosive gas atmospheres”
GB3836.15-2000 “Electrical apparatus for explosive gas atmospheres Part 15: Electrical installations in hazardous area (other than mines)”
GB3836.16-2006 “Electrical apparatus for explosive gas atmospheres Part 16: Inspection and maintenance of electrical installation (other than mines)”
GB3836.18-2010 “Intrinsically Safe System”
GB50257-2014 “Code for construction and acceptance of electric device for explosion atmospheres and fire hazard electrical equipment installation engineering”

N3 China Type n
Certificate: 3051S: GYJ15.1106X [Mfg China]
3051SF: GYJ15.1107X [Mfg China]
Markings: Ex nA IIC T5 Gc

Special Conditions for Safe Use (X):

1. The ambient temperature range is: $-40\text{ }^{\circ}\text{C} \leq T_a \leq 85\text{ }^{\circ}\text{C}$.
2. Maximum input voltage: 45 V
3. Cable glands, conduit or blanking plugs, certified by NEPSI with Ex e or Ex n protection type and IP66 degree of protection provided by enclosure, should be used on external connections and redundant cable entries.
4. Maintenance should be done in non-hazardous location.
5. End users are not permitted to change any components inside, but to settle the problem in conjunction with manufacturer to avoid damage to the product.

6. When installation, use and maintenance of this product, observe following standards:
GB3836.13-2013 “Electrical apparatus for explosive gas atmospheres Part 13: Repair and overhaul for apparatus used in explosive gas atmospheres”
GB3836.15-2000 “Electrical apparatus for explosive gas atmospheres Part 15: Electrical installations in hazardous area (other than mines)”
GB3836.16-2006 “Electrical apparatus for explosive gas atmospheres Part 16: Inspection and maintenance of electrical installation (other than mines)”
GB50257-1996 “Code for construction and acceptance of electric device for explosion atmospheres and fire hazard electrical equipment installation engineering”

B.1.10 EAC - Belarus, Kazakhstan, Russia

- EM** Technical Regulation Customs Union (EAC) Flameproof and Dust Ignition-proof
Certificate: RU C-US.AA87.B.00378
Markings: Ga/Gb Ex d IIC T6...T4 X
Ex tb IIIC T105 °C T₅₀₀95 °C Db X
Ex ta IIIC T105 °C T₅₀₀95 °C Da X
- IM** Technical Regulation Customs Union (EAC) Intrinsic Safety
Certificate: RU C-US.AA87.B.00094
Markings: 0Ex ia IIC T4 Ga X

B.1.11 Japan

- E4** Japan Flameproof
Certificate: TC15682, TC15683, TC15684, TC15685, TC15686, TC15687, TC15688, TC15689, TC15690, TC17099, TC17100, TC17101, TC17102, TC18876
3051ERS: TC20215, TC20216, TC20217, TC20218, TC20219, TC20220, TC20221
Markings: Ex d IIC T6

B.1.12 Republic of Korea

- EP** Republic of Korea Flameproof
Certificate: 12-KB4BO-0180X [Mfg USA],
11-KB4BO-0068X [Mfg Singapore]
Markings: Ex d IIC T5 or T6
- IP** Republic of Korea Intrinsic Safety
Certificate: 12-KB4BO-0202X [HART – Mfg USA],
12-KB4BO-0204X [Fieldbus – Mfg USA],
12-KB4BO-0203X [HART – Mfg Singapore],
13-KB4BO-0296X [Fieldbus – Mfg Singapore]
Markings: Ex d IIC T4

B.1.13 Combinations

- K1** Combination of E1, I1, N1, and ND
- K2** Combination of E2 and I2
- K5** Combination of E5 and I5
- K6** Combination of E6 and I6
- K7** Combination of E7, I7, and N7
- KA** Combination of E1, I1, E6, and I6
- KB** Combination of E5, I5, E6, and I6
- KC** Combination of E1, I1, E5, and I5
- KD** Combination of E1, I1, E5, I5, E6, and I6
- KG** Combination of IA, IE, IF, and IG
- KM** Combination of EM and IM
- KP** Combination of EP and IP

B.1.14 Additional Certifications

- SBS** American Bureau of Shipping (ABS) Type Approval
 Certificate: 00-HS145383-6-PDA
 Intended Use: Measure gauge or absolute pressure of liquid, gas or vapor applications on ABS classed vessels, marine, and offshore installations.
- SBV** Bureau Veritas (BV) Type Approval
 Certificate: 31910/A0 BV
 Requirements: Bureau Veritas Rules for the Classification of Steel Ships
 Application: Class Notations: AUT-UMS, AUT-CCS, AUT-PORT and AUT-IMS

- SDN** Det Norske Veritas (DNV) Type Approval
 Certificate: A-14186
 Intended Use: Det Norske Veritas' Rules for Classification of Ships, High Speed and Light Craft, and Det Norske Veritas' Offshore Standards

Application:

Location classes	
Type	3051S
Temperature	D
Humidity	B
Vibration	A
EMC	A
Enclosure	D/IP66/IP68

- SLL** Lloyds Register (LR) Type Approval
 Certificate: 11/60002
 Application: Environmental categories ENV1, ENV2, ENV3, and ENV5
- D3** Custody Transfer – Measurement Canada Accuracy Approval [3051S Only]
 Certificate: AG-0501, AV-2380C

B.2 Rosemount 3051S Wireless

Rev 2.2

B.2.1 European Directive Information

A copy of the EC Declaration of Conformity can be found at the end of the Quick Start Guide. The most recent revision of the EC Declaration of Conformity can be found at Emerson.com/Rosemount.

B.2.2 Telecommunication compliance

All wireless devices require certification to ensure that they adhere to regulations regarding the use of the RF spectrum. Nearly every country requires this type of product certification. Emerson™ is working with governmental agencies around the world to supply fully compliant products and remove the risk of violating country directives or laws governing wireless device usage.

B.2.3 FCC and IC

This device complies with Part 15 of the FCC Rules. Operation is subject to the following conditions: This device may not cause harmful interference. This device must accept any interference received, including interference that may cause undesired operation. This device must be installed to ensure a minimum antenna separation distance of 20 cm from all persons.

B.2.4 Ordinary Location Certification

As standard, the transmitter has been examined and tested to determine that the design meets the basic electrical, mechanical, and fire protection requirements by a nationally recognized test laboratory (NRTL) as accredited by the Federal Occupational Safety and Health Administration (OSHA).

B.2.5 Installing Equipment in North America

The US National Electrical Code (NEC) and the Canadian Electrical Code (CEC) permit the use of Division marked equipment in Zones and Zone marked equipment in Divisions. The markings must be suitable for the area classification, gas, and temperature class. This information is clearly defined in the respective codes.

B.2.6 USA

- I5** USA Intrinsically Safe (IS), Nonincendive (NI), and Dust-Ignitionproof (DIP)
Certificate: 3027705
Standards: FM Class 3600 – 2011,
FM Class 3610 – 2010,
FM Class 3611 – 2004,
FM Class 3810 – 2005,
NEMA 250 –2003
Markings: IS CL I, DIV 1, GP A, B, C, D;
CL II, DIV 1, GP E, F, G; CL III T4;
CL 1, Zone 0 AEx ia IIC T4;
NI CL 1, DIV 2, GP A, B, C, D T4;
DIP CL II, DIV 1, GP E, F, G; CL III, T5;
T4(–50 °C ≤ T_a ≤ +70 °C)/
T5(–50 °C ≤ T_a ≤ +85 °C); when connected
per Rosemount drawing 03151-1000; Type
4X

Special Conditions for Safe Use (X):

1. The Rosemount 3051S and SMV Wireless Transmitters shall only be used with the 701PBKKF Rosemount SmartPower™ Battery Pack or alternately the Perpetuum Intelligent Power Module Vibration Harvester.
2. The transmitter may contain more than 10% aluminum and is considered a potential risk of ignition by impact or friction.
3. The surface resistivity of the antenna is greater than 1 GΩ. To avoid electrostatic charge build-up, it must not be rubbed or cleaned with solvents or a dry cloth.

B.2.7 Canada

- I6** CSA Intrinsically Safe
 Certificate: CSA 1143113
 Standards: CAN/CSA C22.2 No. 0-10,
 CSA Std C22.2 No. 30-M1986,
 CAN/CSA C22.2 No. 94-M91,
 CSA Std C22.2 No. 142-M1987,
 CSA Std C22.2 No. 157-92,
 ANSI/ISA 12.27.01-2003,
 CSA Std C22.2 No. 60529:05
 Markings: Intrinsically Safe Class I, Division 1; suitable
 for Class 1, Zone 0, IIC, T3C;
 when connected per Rosemount drawing
 03151-1010; Type 4X

B.2.8 Europe

- I1** ATEX Intrinsic Safety
 Certificate: Baseefa13ATEX0127X
 Standards: EN 60079-0:2012, EN 60079-11:2012
 Markings: Ⓜ II 1 G Ex ia IIC T4 Ga,
 T4(-60 °C ≤ T_a ≤ +70 °C)

Special Conditions for Safe Use (X):

1. The Rosemount 3051S Wireless and Rosemount 3051SMV Wireless enclosure may be made of aluminum alloy and given a protective polyurethane paint finish; however, care should be taken to protect it from impact or abrasion if located in a zone 0 area.
2. The surface resistivity of the antenna is greater than 1 GΩ. To avoid electrostatic charge build-up, it must not be rubbed or cleaned with solvents or dry cloth.

B.2.9 International

- I7** IECEx Intrinsic Safety
 Certificate: IECEx BAS 13.0068X
 Standards: IEC 60079-0: 2011, IEC 60079-11: 2011
 Markings: Ex ia IIC T4 Ga, T4(-60 °C ≤ T_a ≤ +70 °C)

Special Conditions for Safe Use (X):

1. The Rosemount 3051S Wireless and Rosemount 3051SMV Wireless enclosure may be made of aluminum alloy and given a protective polyurethane paint finish; however, care should be taken to protect it from impact or abrasion if located in a zone 0 area.
2. The surface resistivity of the antenna is greater than 1GΩ. To avoid electrostatic charge build-up, it must not be rubbed or cleaned with solvents or dry cloth.

B.2.10 Brazil

- I2** INMETRO Intrinsic Safety
 Certificate: UL-BR 14.0760X
 Standards: ABNT NBR IEC60079-0:2008, + Errata
 1:2011, ABNT NBRIEC60079-11:2009,
 Markings: Ex ia IIC T4 Ga, T4(-60 °C ≤ T_a ≤ +70 °C)

Special Condition for Safe Use (X):

1. See appropriate certificate.

B.2.11 China

- I3** China Intrinsic Safety
 Certificate: 3051S Wireless: GYJ161250X
 3051SFx GYJ11.1707X [Flowmeters]
 Standards: GB3836.1-2010, GB3836.4-2010,
 GB3836.20-2010
 Markings: Ex ia IIC T4 Ga, T4 -+60 ~ 70 °C

Special Condition for Safe Use (X):

1. See appropriate certificate.

Note

Not currently available on the Rosemount 3051S MultiVariable Wireless Transmitter.

B.2.12 Japan

- I4** TIIS Intrinsically Safe
 Certificate: TC18649, TC18650, TC18657
 Markings: Ex ia IIC T4 (-20 ~ 60 °C)

Note

Not currently available on the 3051S MultiVariable Wireless Transmitter.

B.2.13 EAC – Belarus, Kazakhstan, Russia

- IM** EAC Intrinsic Safety
 Certificate: RU C-US.AA87.B.00094
 Markings: 0Ex ia IIC T4 Ga X (-60 °C ≤ T_a ≤ +70 °C)

Special Condition for Safe Use (X):

1. See certificate for special conditions.

B.2.14 Republic of Korea

- IP** Korea Intrinsic Safety
 Certificate: 12-KB4BO-0202X, 12-KB4BO-0203X
 Markings: Ex ia IIC T4, (-60 °C ≤ T_a ≤ +70 °C)

Special Condition for Safe Use (X):

1. See certificate for special conditions.

Note

Not currently available on the Rosemount 3051S MultiVariable Wireless Transmitter.

B.2.15 Combination

KQ Combination of I1, I5, and I6

B.3 Rosemount 3051

Rev 1.7

B.3.1 European Directive Information

A copy of the EU Declaration of Conformity can be found at the end of the Quick Start Guide. The most recent revision of the EU Declaration of Conformity can be found at Emerson.com/Rosemount.

B.3.2 Ordinary Location Certification

As standard, the transmitter has been examined and tested to determine that the design meets the basic electrical, mechanical, and fire protection requirements by FM Approvals, a nationally recognized test laboratory (NRTL) as accredited by the Federal Occupational Safety and Health Administration (OSHA).

B.3.3 North America

- E5** USA Explosionproof (XP) and Dust-Ignitionproof (DIP) Range 1–5
 Certificate: 0T2H0.AE
 Standards: FM Class 3600 - 2011, FM Class 3615 - 2006, FM Class 3810 - 2005, ANSI/NEMA 250 - 2003
 Markings: XP CL I, DIV 1, GP B, C, D; DIP CL II, DIV 1, GP E, F, G; CL III; T5($-50^{\circ}\text{C} \leq T_a \leq +85^{\circ}\text{C}$); Factory Sealed; Type 4X
- Range 6
 Certificate: 1053834
 Standards: ANSI/ISA 12.27.01-2003, CSA Std. C22.2 No. 30 -M1986, CSA Std. C22.2 No.142-M1987, CSA Std. C22.2 No. 213 - M1987
 Markings: XP Class I, Division 1, Groups B, C and D, T5, ($-50^{\circ}\text{C} \leq T_a \leq +85^{\circ}\text{C}$) Suitable for Class I, Zone 1, Group IIB+H2, T5; DIP Class II and Class III, Division 1, Groups E, F and G, T5, ($-50^{\circ}\text{C} \leq T_a \leq +85^{\circ}\text{C}$); Type 4X; Factory Sealed; Single Seal (See drawing 03031-1053)

- I5** USA Intrinsic Safety (IS) and Nonincendive (NI) Range 1–5
 Certificate: FM16US0120X
 Standards: FM Class 3600 - 2011, FM Class 3610 - 2010, FM Class 3611 - 2004, FM Class 3810 - 2005, ANSI/NEMA 250 - 2008
 Markings: IS CL I, DIV 1, GP A, B, C, D; CL II, DIV 1, GP E, F, G; Class III; DIV 1 when connected per Rosemount drawing 03031-1019; NI CL 1, DIV 2, GP A, B, C, D; T4 ($-50^{\circ}\text{C} \leq T_a \leq +70^{\circ}\text{C}$) [HART], [HART]; T4 ($-50^{\circ}\text{C} \leq T_a \leq +60^{\circ}\text{C}$) [FOUNDATION Fieldbus/PROFIBUS®]; Type 4x

Special Conditions for Safe Use (X):

1. The Rosemount 3051 Transmitter housing contains aluminum and is considered a potential risk of ignition by impact or friction. Care must be taken into account during installation and use to prevent impact and friction.
2. The Rosemount 3051 Transmitter with the transient terminal block (option code T1) will not pass the 500 Vrms dielectric strength test and this must be taken into account during installation.

Range 6

Certificate: 1053834

Standards: ANSI/ISA 12.27.01-2003, CSA Std. C22.2 No.142-M1987, CSA Std. C22.2. No.157-92

Markings: IS Class I, II, III, Division 1 Groups A, B, C, D, E, F, and G when connected in accordance with Rosemount drawing 03031-1024, Suitable for Class I, Zone 0 Group IIC; Class I, Division 2, Groups A, B, C and D; NIFW; Suitable for Class I Zone 2, Group IIC; HART: T4 ($-60^{\circ}\text{C} \leq T_a \leq +70^{\circ}\text{C}$); T5 ($-60^{\circ}\text{C} \leq T_a \leq +40^{\circ}\text{C}$) FOUNDATION Fieldbus/PROFIBUS: T4 ($-60^{\circ}\text{C} \leq T_a \leq +60^{\circ}\text{C}$) Type 4X; Factory Sealed; Single Seal (See drawing 03031-1053)

- IE** USA FISCO Range 1–5
 Certificate: FM16US0120X
 Standards: FM Class 3600 - 2011, FM Class 3610 - 2010, FM Class 3611 - 2004, FM Class 3810 - 2005

Markings: IS CL I, DIV 1, GP A, B, C, D when connected per Rosemount drawing 03031-1019 ($-50\text{ }^{\circ}\text{C} \leq T_a \leq +60\text{ }^{\circ}\text{C}$); Type 4x

Special Conditions for Safe Use (X):

1. The Rosemount 3051 Transmitter housing contains aluminum and is considered a potential risk of ignition by impact or friction. Care must be taken into account during installation and use to prevent impact and friction.
2. The Rosemount 3051 Transmitter with the transient terminal block (option code T1) will not pass the 500Vrms dielectric strength test and this must be taken into account during installation.

Range 6

Certificate: 1053834

Standards: ANSI/ISA 12.27.01-2003,
CSA Std. C22.2 No.142-M1987,
CSA Std. C22.2. No.157-92

Markings: IS Class I, Division 1 Groups A, B, C, D, T4 ($-60\text{ }^{\circ}\text{C} \leq T_a \leq +60\text{ }^{\circ}\text{C}$) when connected in accordance with Rosemount drawing 03031-1024, Suitable for Class I, Zone 0 Group IIC; Type 4X; Factory Sealed; Single Seal (See drawing 03031-1053)

C6 Canada Explosionproof, Dust-Ignitionproof, Intrinsic Safety and Nonincendive

Certificate: 1053834

Standards: ANSI/ISA 12.27.01-2003,
CSA Std. C22.2 No. 30 -M1986,
CSA Std. C22.2 No.142-M1987,
CSA Std. C22.2. No.157-92,
CSA Std. C22.2 No. 213 - M1987,
CAN/CSA C22.2 No. 0-10,
CSA Std C22.2 No. 25-1966,
CAN/CSA-C22.2 No. 94-M91,
CAN/CSA-E60079-0-07,
CAN/CSA-E60079-1-07

Markings: Explosionproof for Class I, Division 1, Groups B, C and D; Suitable for Class I, Zone 1, Group IIB+H2, T5 ($-50\text{ }^{\circ}\text{C} \leq T_a \leq +85\text{ }^{\circ}\text{C}$); Dust-Ignitionproof Class II, III Division 1, Groups E, F, G; T5 ($-50\text{ }^{\circ}\text{C} \leq T_a \leq +85\text{ }^{\circ}\text{C}$); Intrinsically Safe Class I, Division 1 Groups A, B, C, D when connected in accordance with Rosemount drawing 03031-1024, Temperature Code T4; Suitable for Class I, Zone 0; Class I Division 2 Groups A, B, C and D, T5 ($-50\text{ }^{\circ}\text{C} \leq T_a \leq +85\text{ }^{\circ}\text{C}$); Suitable for Class I Zone 2, Group IIC; Type 4X; Factory Sealed; Single Seal (See drawing 03031-1053)

E6 Canada Explosionproof, Dust-Ignitionproof and Certificate: 1053834

Standards: ANSI/ISA 12.27.01-2003,
CSA Std. C22.2 No. 30 -M1986,
CSA Std. C22.2 No.142-M1987,
CSA Std. C22.2 No. 213 - M1987

Markings: Explosionproof Class I, Division 1, Groups B, C and D; Suitable for Class I, Zone 1, Group IIB+H2, T5 ($-50\text{ }^{\circ}\text{C} \leq T_a \leq +85\text{ }^{\circ}\text{C}$); Dust-Ignitionproof for Class II and Class III, Division 1, Groups E, F and G; T5 ($-50\text{ }^{\circ}\text{C} \leq T_a \leq +85\text{ }^{\circ}\text{C}$); Class I, Division 2, Groups A, B, C and D; T5 ($-50\text{ }^{\circ}\text{C} \leq T_a \leq +85\text{ }^{\circ}\text{C}$); Suitable for Class I Zone 2, Group IIC; Type 4X; Factory Sealed; Single Seal (See drawing 03031-1053)

B.3.4 Europe

E8 ATEX Flameproof and Dust Certificate: KEMA00ATEX2013X;Baseefa11ATEX0275X

Standards: EN60079-0:2012 + A11:2013,
EN60079-1:2014, EN60079-26:2015,
EN60079-31:2009


Markings:  II 1/2 G Ex db IIC T6...T4 Ga/Gb
T6($-60\text{ }^{\circ}\text{C} \leq T_a \leq +70\text{ }^{\circ}\text{C}$),
T4/T5($-60\text{ }^{\circ}\text{C} \leq T_a \leq +80\text{ }^{\circ}\text{C}$);
Ex II 1 D Ex ta IIIC T95 $^{\circ}\text{C}$ T₅₀₀ 105 $^{\circ}\text{C}$ Da
($-20\text{ }^{\circ}\text{C} \leq T_a \leq +85\text{ }^{\circ}\text{C}$)

Table B-2. Process Temperature

Temperature class	Process temperature
T6	-60 $^{\circ}\text{C}$ to +70 $^{\circ}\text{C}$
T5	-60 $^{\circ}\text{C}$ to +80 $^{\circ}\text{C}$
T4	-60 $^{\circ}\text{C}$ to +120 $^{\circ}\text{C}$

Special Conditions for Safe Use (X):

1. This device contains a thin wall diaphragm. Installation, maintenance and use shall take into account the environmental conditions to which the diaphragm will be subjected. The manufacturer's instructions for installation and maintenance shall be followed in detail to assure safety during its expected lifetime.
2. Flameproof joints are not intended for repair.
3. Non-standard paint options may cause risk from electrostatic discharge. Avoid installations that could cause electrostatic build-up on painted surfaces, and only clean the painted surfaces with a damp cloth. If paint is ordered through a special option code, contact the manufacturer for more information.
4. Some variants of the equipment have reduced markings on the nameplate. Refer to the Certificate for full equipment marking.

I1 ATEX Intrinsic Safety and Dust

Certificate: BAS97ATEX1089X; Baseefa11ATEX0275X
 Standards: EN60079-0:2012, EN60079-11:2012, EN60079-31:2009

Markings: HART: Ex II 1 G Ex ia IIC T5/T4 Ga
 T5(-60 °C ≤ T_a ≤ +40 °C),
 T4(-60 °C ≤ T_a ≤ +70 °C)
 Fieldbus/PROFIBUS: Ex II 1 G Ex ia Ga IIC
 T4(-60 °C ≤ T_a ≤ +60 °C)
 DUST: Ex II 1 D Ex ta IIIC T95 °C T₅₀₀105 °C
 Da (-20 °C ≤ T_a ≤ +85 °C)

Table B-3. Input Parameters

Parameter	HART	Fieldbus/PROFIBUS
Voltage U _i	30 V	30 V
Current I _i	200 mA	300 mA
Power P _i	0.9 W	1.3 W
Capacitance C _i	0.012 μF	0 μF
Inductance L _i	0 mH	0 mH

Special Conditions for Safe Use (X):

1. The apparatus is not capable of withstanding the 500 V insulation test required by clause 6.3.12 of EN60079-11:2012. This must be taken into account when installing the apparatus.
2. The enclosure may be made of aluminum alloy and given a protective polyurethane paint finish; however care should be taken to protect it from impact or abrasion if located in Zone 0.
3. Some variants of the equipment have reduced markings on the nameplate. Refer to the Certificate for full equipment marking.

IA ATEX FISCO

Certificate: BAS97ATEX1089X
 Standards: EN60079-0:2012, EN60079-11:2009
 Markings: Ⓔ II 1 G Ex ia IIC Ga
 T4(-60 °C ≤ T_a ≤ +60 °C)

Table B-4. Input Parameters

Parameter	FISCO
Voltage U _i	17.5 V
Current I _i	380 mA
Power P _i	5.32 W
Capacitance C _i	< 5 nF
Inductance L _i	< 10 μH

Special Conditions for Safe Use (X):

1. The apparatus is not capable of withstanding the 500 V insulation test required by EN60079-11. This must be taken into account when installing the apparatus.
2. The enclosure may be made of aluminum alloy and given a protective polyurethane paint finish; however care should be taken to protect it from impact or abrasion if located in Zone 0.

N1 ATEX Type n and Dust

Certificate: BAS00ATEX3105X; Baseefa11ATEX0275X
 Standards: EN60079-0:2012, EN60079-15:2010, EN60079-31:2009

Markings: Ex II 3 G Ex nA IIC T5 Gc
 (-40 °C ≤ T_a ≤ +70 °C);
 Ex II 1 D Ex ta IIIC T95 °C T₅₀₀105 °C Da
 (-20 °C ≤ T_a ≤ +85 °C)

Special Conditions for Safe Use (X):

1. This apparatus is not capable of withstanding the 500 V insulation test that is required by clause 6.8.1 of EN60079-15. This must be taken into account when installing the apparatus.
2. Some variants of the equipment have reduced markings on the nameplate. Refer to the Certificate for full equipment marking.

B.3.5 International

E7 IECEx Flameproof and Dust

Certificate: IECEx KEM 09.0034X; IECEx BAS 10.0034X
 Standards: IEC60079-0:2011, IEC60079-1:2014-06, IEC60079-26:2014-10, IEC60079-31:2008

Markings: Ex db IIC T6...T4 Ga/Gb
T6(-60 °C ≤ T_a ≤ +70 °C),
T4/T5(-60 °C ≤ T_a ≤ +80 °C);
Ex ta IIIC T95 °C T₅₀₀105 °C Da
(-20 °C ≤ T_a ≤ +85 °C)

Table B-5. Process Temperature

Temperature class	Process temperature
T6	-60 °C to +70 °C
T5	-60 °C to +80 °C
T4	-60 °C to +80 °C

Special Conditions for Safe Use (X):

1. This device contains a thin wall diaphragm. Installation, maintenance and use shall take into account the environmental conditions to which the diaphragm will be subjected. The manufacturer's instructions for installation and maintenance shall be followed in detail to assure safety during its expected lifetime.
2. Flameproof joints are not intended for repair.
3. Non-standard paint options may cause risk from electrostatic discharge. Avoid installations that could cause electrostatic build-up on painted surfaces, and only clean the painted surfaces with a damp cloth. If paint is ordered through a special option code, contact the manufacturer for more information.
4. Some variants of the equipment have reduced markings on the nameplate. Refer to the Certificate for full equipment marking.

I7 IECEx Intrinsic Safety

Certificate: IECEx BAS 09.0076X
Standards: IEC60079-0:2011, IEC60079-11:2011
Markings: HART: Ex ia IIC T5/T4 Ga,
T5(-60 °C ≤ T_a ≤ +40 °C),
T4(-60 °C ≤ T_a ≤ +70 °C)
Fieldbus/PROFIBUS: Ex ia IIC Ga
T4(-60 °C ≤ T_a ≤ +60 °C)

Table B-6. Input Parameters

Parameter	HART	Fieldbus/PROFIBUS
Voltage U _i	30 V	30 V
Current I _i	200 mA	300 mA
Power P _i	0.9 W	1.3 W
Capacitance C _i	0.012 μF	0 μF
Inductance L _i	0 mH	0 mH

Special Conditions for Safe Use (X):

1. If the apparatus is fitted with an optional 90 V transient suppressor, it is not capable of withstanding the 500 V insulation test required by clause 6.3.12 of IEC60079-11. This must be taken into account when installing the apparatus.
2. The enclosure may be made of aluminum alloy and given a protective polyurethane paint finish; however, care should be taken to protect it from impact or abrasion if located in Zone 0.
IECEx Mining (Special A0259)
Certificate: IECEx TSA 14.0001X
Standards: IEC60079-0:2011, IEC60079-11:2011
Markings: Ex ia I Ma (-60 °C ≤ T_a ≤ +70 °C)

Table B-7. Input Parameters

Parameter	HART	Fieldbus/PROFIBUS	FISCO
Voltage U _i	30 V	30 V	17.5 V
Current I _i	200 mA	300 mA	380 mA
Power P _i	0.9 W	1.3 W	5.32 W
Capacitance C _i	0.012 μF	0 μF	< 5 nF
Inductance L _i	0 mH	0 mH	< 10 μH

Special Conditions for Safe Use (X):

1. If the apparatus is fitted with optional 90 V transient suppressor, it is not capable of withstanding the 500 V insulation test required by IEC60079-11. This must be taken into account when installing the apparatus.
2. It is a condition of safe use that the above input parameters shall be taken into account during installation.
3. It is a condition of manufacture that only the apparatus fitted with housing, covers and sensor module housing made out of stainless steel are used in Group I applications.

N7 IECEx Type n

Certificate: IECEx BAS 09.0077X
Standards: IEC60079-0:2011, IEC60079-15:2010
Markings: Ex nA IIC T5 Gc (-40 °C ≤ T_a ≤ +70 °C)

Special Condition for Safe Use (X):

1. The apparatus is not capable of withstanding the 500 V insulation test required by IEC60079-15. This must be taken into account when installing the apparatus.

B.3.6 Brazil

- E2** INMETRO Flameproof
 Certificate: UL-BR 13.0643X
 Standards: ABNT NBR IEC60079-0:2008 + Errata 1:2011, ABNT NBR IEC60079-1:2009 + Errata 1:2011, ABNT NBR IEC60079-26:2008 + Errata 1:2008
 Markings: Ex db IIC T6...T4 Ga/Gb, T6(-60 °C ≤ T_a ≤ +70 °C), T4/T5(-60 °C ≤ T_a ≤ +80 °C)

Special Conditions for Safe Use (X):

1. This device contains a thin wall diaphragm less than 1 mm thickness that forms a boundary between zone 0 (process connection) and zone 1 (all other parts of the equipment). The model code and datasheet are to be consulted for details of the diaphragm material. Installation, maintenance and use shall take into account the environmental conditions to which the diaphragm will be subjected. The manufacturer's instructions for installation and maintenance shall be followed in detail to assure safety during its expected lifetime.
2. Flameproof joints are not intended for repair.
3. Non-standard paint options may cause risk from electrostatic discharge. Avoid installations that could cause electrostatic build-up on painted surfaces, and only clean the painted surfaces with a damp cloth. If paint is ordered through a special option code, contact the manufacturer for more information.

- I2** INMETRO Intrinsic Safety
 Certificate: UL-BR 13.0584X
 Standards: ABNT NBR IEC60079-0:2008 + Errata 1:2011, ABNT NBR IEC60079-11:2009
 Markings: HART: Ex ia IIC T5/T4 Ga, T5(-60 °C ≤ T_a ≤ +40 °C), T4(-60 °C ≤ T_a ≤ +70 °C)
 Fieldbus/PROFIBUS: Ex ia IIC T4 Ga (-60 °C ≤ T_a ≤ +60 °C)

Table B-8. Input Parameters

Parameter	HART	Fieldbus/PROFIBUS
Voltage U _i	30 V	30 V
Current I _i	200 mA	300 mA
Power P _i	0.9 W	1.3 W
Capacitance C _i	0.012 μF	0 μF
Inductance L _i	0 mH	0 mH

Special Conditions for Safe Use (X):

1. If the equipment is fitted with an optional 90 V transient suppressor, it is not capable of withstanding the 500 V insulation test required by ABNT NBR IRC 60079-11. This must be taken into account when installing the equipment.
2. The enclosure may be made of aluminum alloy and given a protective polyurethane paint finish; however, care should be taken to protect it from impact or abrasion if located in Zone 0.

- IB** INMETRO FISCO
 Certificate: UL-BR 13.0584X
 Standards: ABNT NBR IEC60079-0:2008 + Errata 1:2011, ABNT NBR IEC60079-11:2009
 Markings: Ex ia IIC T4 Ga (-60 °C ≤ T_a ≤ +60 °C)

Table B-9. Input Parameters

Parameter	FISCO
Voltage U _i	17.5 V
Current I _i	380 mA
Power P _i	5.32 W
Capacitance C _i	< 5 nF
Inductance L _i	< 10 μH

Special Conditions for Safe Use (X):

1. If the equipment is fitted with an optional 90 V transient suppressor, it is not capable of withstanding the 500 V insulation test required by ABNT NBR IEC 60079-11. This must be taken into account when installing the equipment.
2. The enclosure may be made of aluminum alloy and given a protective polyurethane paint finish; however, care should be taken to protect it from impact or abrasion if located in Zone 0.

B.3.7 China

- E3** China Flameproof
 Certificate: GYJ14.1041X; GYJ15.1368X [Flowmeters]
 Standards: GB12476-2000, GB3836.1-2010, GB3836.2-2010, GB3836.20-2010
 Markings: Ex d IIC T6/T5 Ga/Gb, T6(-50 °C ≤ T_a ≤ +65 °C), T5(-50 °C ≤ T_a ≤ +80 °C)

Special Conditions for Safe Use (X):

1. The relation between ambient temperature arrange and temperature class is as follows:

T_a	Temperature class
-50 °C~+80 °C	T5
-50 °C~+65 °C	T6

When used in a combustible dust environment, the maximum ambient temperature is 80 °C.

2. The earth connection facility in the enclosure should be connected reliably.
 3. Cable entry certified by notified body with type of protection Ex d IIC in accordance with GB3836.1-2000 and GB3836.2-2000, should be applied when installed in a hazardous location. When used in combustible dust environment, cable entry in accordance with IP66 or higher level should be applied.
 4. Obey the warning “Keep tight when the circuit is alive.”
 5. End users are not permitted to change any internal components.
 6. During installation, use and maintenance of this product, observe the following standards:
GB3836.13-1997, GB3836.15-2000,
GB3836.16-2006, GB50257-1996, GB12476.2-2006,
GB15577-2007
- I3** China Intrinsic Safety
Certificate: GYJ13.1362X; GYJ15.1367X [Flowmeters]
Standards: GB3836.1-2010, GB3836.4-2010,
GB3836.20-2010, GB12476.1-2000
Markings: Ex ia IIC Ga T4/T5

Special Conditions for Safe Use (X):

1. Symbol “X” is used to denote specific conditions of use:
 - a. If the apparatus is fitted with an optional 90 V transient suppressor, it is not capable of withstanding the 500 V insulation test for 1 minute. This must be taken into account when installing the apparatus.
 - b. The enclosure may be made of aluminum alloy and given a protective polyurethane paint finish; however, care should be taken to protect it from impact or abrasion if located in Zone 0.

2. The relation between T code and ambient temperature range is:

Model	T code	Temperature range
HART	T5	$-60\text{ °C} \leq T_a \leq +40\text{ °C}$
HART	T4	$-60\text{ °C} \leq T_a \leq +70\text{ °C}$
Fieldbus/PROFIBUS/FISCO	T4	$-40\text{ °C} \leq T_a \leq +60\text{ °C}$

3. Intrinsically Safe parameters:

Table B-10. Input Parameters

Parameter	HART	Fieldbus/ PROFIBUS	FISCO
Voltage U_i	30 V	30 V	17.5 V
Current I_i	200 mA	300 mA	380 mA
Power P_i	0.9 W	1.3 W	5.32 W
Capacitance C_i	0.012 μF	0 μF	<5 nF
Inductance L_i	0 mH	0 mH	<10 μH

Note

FISCO parameters apply to both Group IIC and IIB.

[For Flowmeters] When Rosemount 644 Temperature Transmitter is used, the transmitter should be used with Ex-certified associated apparatus to establish explosion protection system that can be used in explosive gas atmospheres. Wiring and terminals should comply with the instruction manual of both Rosemount 644 and associated apparatus. The cables between Rosemount 644 and associated apparatus should be shielded cables (the cables must have insulated shield). The shielded cable has to be grounded reliably in a non-hazardous area.

4. Transmitters comply with the requirements for FISCO field devices specified in IEC60079-27:2008. For the connection of an intrinsically safe circuit in accordance with FISCO Model, FISCO parameters are listed in [Table B-10](#).
5. The product should be used with Ex-certified associated apparatus to establish explosion protection system that can be used in explosive gas atmospheres. Wiring and terminals should comply with the instruction manual of the product and associated apparatus.
6. The cables between this product and associated apparatus should be shielded cables (the cables must have insulated shield). The shielded cable has to be grounded reliably in a non-hazardous area.

7. End users are not permitted to change any internal components but to settle the problem in conjunction with the manufacturer to avoid damage to the product.
8. During installation, use and maintenance of this product, observe the following standards: GB3836.13-1997, GB3836.15-2000, GB3836.16-2006, GB50257-1996, GB12476.2-2006, GB15577-2007

N3 China Type n

Certificate: GYJ15.1105X

Standards: GB3836.1-2010, GB3836.8-2003

Markings: Ex nA nL IIC T5 Gc (-40 °C ≤ T_a ≤ +70 °C)

Special Condition for Safe Use (X):

1. Symbol “X” is used to denote specific conditions of use: The apparatus is not capable of withstanding the 500 V test to earth for one minute. The must be taken into consideration during installation.

B.3.8 Japan

E4 Japan Flameproof

Certificate: TC20577, TC20578, TC20583, TC20584 [HART]; TC20579, TC20580, TC20581, TC20582 [Fieldbus]

Markings: Ex d IIC T5

B.3.9 Technical Regulations Customs Union (EAC)

EM EAC Flameproof

Certificate: RU C-US.GB05.B.01197

Markings: Ga/Gb Ex d IIC T5/T6 X, T5(-60 °C ≤ T_a ≤ +80 °C), T6(-60 °C ≤ T_a ≤ +65 °C)

Special Condition for Safe Use (X):

1. See certificate for special conditions.

IM EAC Intrinsically Safe

Certificate: RU C-US.GB05.B.01197

Markings: HART: 0Ex ia IIC T4/T5 Ga X, T4(-60 °C ≤ T_a ≤ +70 °C), T5(-60 °C ≤ T_a ≤ +40 °C)
Fieldbus/PROFIBUS: 0Ex ia IIC T4 Ga X (-60 °C ≤ T_a ≤ +60 °C)

Special Condition for Safe Use (X):

1. See certificate for special conditions.

B.3.10 Combinations

- K2** Combination of E2 and I2
- K5** Combination of E5 and I5
- K6** Combination of C6, E8, and I1
- K7** Combination of E7, I7, and N7
- K8** Combination of E8, I1, and N1
- KB** Combination of E5, I5, and C6
- KD** Combination of E8, I1, E5, I5, and C6
- KM** Combination of EM and IM

B.3.11 Conduit Plugs and Adapters

IECEx Flameproof and Increased Safety

Certificate: IECEx FMG 13.0032X

Standards: IEC60079-0:2011, IEC60079-1:2007, IEC60079-7:2006-2007

Markings: Ex de IIC Gb

ATEX Flameproof and Increased Safety

Certificate: FM13ATEX0076X

Standards: EN60079-0:2012, EN60079-1:2007, IEC60079-7:2007

Markings: Ⓜ II 2 G Ex de IIC Gb

Table B-11. Conduit Plug Thread Sizes

Thread	Identification mark
M20 × 1.5	M20
1/2-14 NPT	1/2 NPT

Table B-12. Thread Adapter Thread Sizes

Male thread	Identification mark
M20 × 1.5-6H	M20
1/2-14 NPT	1/2-14 NPT
3/4-14 NPT	3/4-14 NPT
Female thread	Identification mark
M20 × 1.5-6H	M20
1/2-14 NPT	1/2-14 NPT
G1/2	G1/2

Special Conditions for Safe Use (X):

1. When the thread adapter or blanking plug is used with an enclosure in type of protection increased safety “e” the entry thread shall be suitably sealed in order to maintain the ingress protection rating (IP) of the enclosure.
2. The blanking plug shall not be used with an adapter.
3. Blanking Plug and Threaded Adapter shall be either NPT or Metric thread forms. G1/2 thread forms are only acceptable for existing (legacy) equipment installations.

B.3.12 Additional Certifications

SBS American Bureau of Shipping (ABS) Type Approval
Certificate: 09-HS446883A-5-PDA
Intended: Marine and Offshore Applications –
Measurement of either gauge or absolute
pressure for liquid, gas, and vapor.

SBV Bureau Veritas (BV) Type Approval
Certificate: 23155
Requirements: Bureau Veritas Rules for the
Classification of Steel Ships
Application: Class notations: AUT-UMS, AUT-CCS,
AUT-PORT and AUT-IMS; Pressure
transmitter type 3051 cannot be
installed on diesel engines

SDN Det Norske Veritas (DNV) Type Approval
Certificate: TAA000004F
Intended Use: DNV GL Rules for Classification – Ships
and offshore units
Application:

Location classes	
Temperature	D
Humidity	B
Vibration	A
EMC	B
Enclosure	D

SLL Lloyds Register (LR) Type Approval
Certificate: 11/60002
Application: Environmental categories ENV1, ENV2,
ENV3, and ENV5

C5 Custody Transfer - Measurement Canada Accuracy
Approval
Certificate: AG-0226; AG-0454; AG-0477

B.4 Rosemount 2051

Rev 1.6

B.4.1 European Directive Information

A copy of the EU Declaration of Conformity can be found at the end of the Quick Start Guide. The most recent revision of the EU Declaration of Conformity can be found at Emerson.com/Rosemount.

B.4.2 Ordinary Location Certification

As standard, the transmitter has been examined and tested to determine that the design meets the basic electrical, mechanical, and fire protection requirements by a nationally recognized test laboratory (NRTL) as accredited by the Federal Occupational Safety and Health Administration (OSHA).

B.4.3 North America

- E5** USA Explosionproof (XP) and Dust-Ignitionproof (DIP)
Certificate: FM16US0232
Standards: FM Class 3600 - 2011,
FM Class 3615 - 2006, FM Class 3616 - 2011,
FM Class 3810 - 2005, ANSI/NEMA 250 -
2008. ANSI/IEC 60529 2004
Markings: XP CL I, DIV 1, GP B, C, D; DIP CL II, DIV 1, GP
E, F, G; CL III; T5(-50 °C ≤ T_a ≤ +85 °C);
Factory Sealed; Type 4X
- I5** USA Intrinsic Safety (IS) and Nonincendive (NI)
Certificate: FM16US0231X
Standards: FM Class 3600 - 2011,
FM Class 3610 - 2010, FM Class 3611 - 2004,
FM Class 3810 - 2005, ANSI/NEMA 250 -
2008
Markings: IS CL I, DIV 1, GP A, B, C, D; CL II, DIV 1, GP E,
F, G; Class III; DIV 1 when connected per
Rosemount drawing 02051-1009; Class I,
Zone 0; AEx ia IIC T4; NI CL 1, DIV 2, GP A, B,
C, D; T4(-50 °C ≤ T_a ≤ +70 °C); Type 4X

Special Condition for Safe Use (X):

1. The Rosemount 2051 Transmitter housing contains aluminum and is considered a potential risk of ignition by impact or friction. Care must be taken into account during installation and use to prevent impact and friction.

- IE** USA FISCO
Certificate: 3033457
Standards: FM Class 3600 – 2011,
FM Class 3610 – 2010,
FM Class 3611 – 2004,
FM Class 3810 – 2005
Markings: IS CL I, DIV 1, GP A, B, C, D when connected
per Rosemount drawing 02051-1009
(-50 °C ≤ T_a ≤ +60 °C); Type 4X
- E6** Canada Explosion-Proof, Dust Ignition Proof
Certificate: 2041384
Standards: CAN/CSA C22.2 No. 0-10,
CSA Std C22.2 No. 25-1966,
CSA Std C22.2 No. 30-M1986,
CAN/CSA-C22.2 No. 94-M91,
CSA Std C22.2 No.142-M1987,
CAN/CSA-C22.2 No.157-92,
CSA Std C22.2 No. 213-M1987,
CAN/CSA-E60079-0:07,
CAN/CSA-E60079-1:07,
CAN/CSA-E60079-11-02,
CAN/CSA-C22.2 No.60529:05,
ANSI/ISA-12.27.01–2003
Markings: Explosion-Proof for Class I, Divisions 1,
Groups B, C, and D. Dust-Ignition Proof for
Class II and Class III, Division 1, Groups E, F,
and G. Suitable for Class I, Division 2;
Groups A, B, C, and D for indoor and
outdoor hazardous locations. Class I Zone 1
Ex d IIC T5. Enclosure type 4X, factory
sealed. Single Seal
- I6** Canada Intrinsic Safety
Certificate: 2041384
Standards: CSA Std. C22.2 No. 142 - M1987,
CSA Std.C22.2 No. 213 - M1987,
CSA Std. C22.2 No.157 - 92,
CSA Std. C22.2 No. 213 - M1987,
ANSI/ISA 12.27.01 – 2003,
CAN/CSA-E60079-0:07,
CAN/CSA-E60079-11:02
Markings: Intrinsically safe for Class I, Division 1,
Groups A,B, C, and D when connected in
accordance with Rosemount drawing
02051-1008. Ex ia IIC T3C. Single Seal.
Enclosure Type 4X

B.4.4 Europe

E1 ATEX Flameproof

Certificate: KEMA 08ATEX0090X
Standards: EN 60079-0:2012 + A11:2013, EN 60079-1:2014, EN 60079-26:2015
Markings: Ⓔ II 1/2 G Ex db IIC Ga/Gb
T6 ($-60^{\circ}\text{C} \leq T_a \leq 70^{\circ}\text{C}$);
T4/T5 ($-60^{\circ}\text{C} \leq T_a \leq 80^{\circ}\text{C}$)

Table B-13. Process Connection Temperature

Temperature class	Process temperature	Ambient temperature
T6	-60°C to $+70^{\circ}\text{C}$	-60°C to $+70^{\circ}\text{C}$
T5	-60°C to $+80^{\circ}\text{C}$	-60°C to $+80^{\circ}\text{C}$
T4	-60°C to $+120^{\circ}\text{C}$	-60°C to $+80^{\circ}\text{C}$

Special Conditions for Safe Use (X):

- Appropriate cable, glands and plugs need to be suitable for a temperature of 5°C greater than maximum specified temperature for location where installed.
- Non-standard paint options may cause risk from electrostatic discharge. Avoid installations that could cause electrostatic build-up on painted surfaces, and only clean the painted surfaces with a damp cloth. If paint is ordered through a special option code, contact the manufacturer for more information.
- The device contains a thin wall diaphragm less than 1 mm thickness that forms a boundary between zone 0 (process connection) and zone 1 (all other parts of the equipment). The model code and datasheet are to be consulted for details of the diaphragm material. Installation, maintenance and use shall take into account the environmental conditions to which the diaphragm shall be subjected. The manufacturer's instructions for installation and maintenance shall be followed in detail to assure safety during its expected lifetime.
- Flameproof joints are not intended for repair.

I1 ATEX Intrinsic Safety

Certificate: Baseefa08ATEX0129X
Standards: EN60079-0:2012, EN60079-11:2012
Markings: Ex II 1 G Ex ia IIC T4 Ga ($-60^{\circ}\text{C} \leq T_a \leq +70^{\circ}\text{C}$)

Table B-14. Input Parameters

Parameter	HART	Fieldbus/PROFIBUS
Voltage U_i	30 V	30 V
Current I_i	200 mA	300 mA
Power P_i	1.0 W	1.3 W
Capacitance C_i	0.012 μF	0 μF
Inductance L_i	0 mH	0 mH

Special Condition for Safe Use (X):

- If the equipment is fitted with an optional 90 V transient suppressor, it is incapable of withstanding the 500 V isolation from earth test and this must be taken into account during installation.
- The enclosure may be made of aluminum alloy and given a protective polyurethane paint finish; however care should be taken to protect it from impact and abrasion when located in Zone 0.

IA ATEX FISCO

Certificate: Baseefa08ATEX0129X
Standards: EN60079-0:2012, EN60079-11:2012
Markings: Ex II 1 G Ex ia IIC T4 Ga ($-60^{\circ}\text{C} \leq T_a \leq +60^{\circ}\text{C}$)

Table B-15. Input Parameters

Parameter	FISCO
Voltage U_i	17.5 V
Current I_i	380 mA
Power P_i	5.32 W
Capacitance C_i	0 μF
Inductance L_i	0 mH

Special Conditions for Safe Use (X):

- If the equipment is fitted with an optional 90 V transient suppressor, it is incapable of withstanding the 500 V isolation from earth test and this must be taken into account during installation.
- The enclosure may be made of aluminum alloy and given a protective polyurethane paint finish; however care should be taken to protect it from impact and abrasion when located in Zone 0.

N1 ATEX Type n

Certificate: Baseefa08ATEX0130X
Standards: EN60079-0:2012, EN60079-15:2010
Markings: Ex II 3G Ex nA IIC T4 Gc ($-40^{\circ}\text{C} \leq T_a \leq +70^{\circ}\text{C}$)

Special Condition for Safe Use (X):

1. If the equipment is fitted with an optional 90 V transient suppressor, it is incapable of withstanding the 500 V electrical strength test as defined in clause 6.5.1 of by EN 60079-15:2010. This must be taken into account during installation.

ND ATEX Dust

Certificate: Baseefa08ATEX0182X
 Standards: EN60079-0:2012, EN60079-31:2009
 Markings: Ⓔ II 1 D Ex ta IIIC T95 °C T₅₀₀ 105 °C
 Da (-20 °C ≤ T_a ≤ +85 °C)

Special Condition for Safe Use (X):

1. If the equipment is fitted with an optional 90 V transient suppressor, it is incapable of withstanding the 500 V isolation from earth test and this must be taken into account during installation.

B.4.5 International

E7 IECEx Flameproof

Certificate: IECExKEM08.0024X
 Standards: IEC 60079-0:2011, IEC 60079-1:2014-06,
 IEC 60079-26:2014-10
 Markings: Ex db IIC T6...T4 Ga/Gb
 T6(-60 °C ≤ T_a ≤ +70 °C),
 T4/T5(-60 °C ≤ T_a ≤ +80 °C)

Table B-16. Process Connection Temperature

Temperature class	Process temperature	Ambient temperature
T6	-60 °C to +70 °C	-60 °C to +70 °C
T5	-60 °C to +80 °C	-60 °C to +80 °C
T4	-60 °C to +120 °C	-60 °C to +80 °C

Special Conditions for Safe Use (X):

1. The device contains a thin wall diaphragm less than 1 mm thickness that forms a boundary between zone 0 (process connection) and zone 1 (all other parts of the equipment). The model code and datasheet are to be consulted for details of the diaphragm material. Installation, maintenance and use shall take into account the environmental conditions to which the diaphragm shall be subjected. The manufacturer's instructions for installation and maintenance shall be followed in detail to assure safety during its expected lifetime.
2. Appropriate cable, glands and plugs need to be suitable for a temperature of 5 °C greater than maximum specified temperature for location where installed.

3. Flameproof joints are not intended for repair.
4. Non-standard paint options may cause risk from electrostatic discharge. Avoid installations that could cause electrostatic build-up on painted surfaces, and only clean the painted surfaces with a damp cloth. If paint is ordered through a special option code, contact the manufacturer for more information.

I7 IECEx Intrinsic Safety

Certificate: IECExBAS08.0045X
 Standards: IEC60079-0:2011, IEC60079-11:2011
 Markings: Ex ia IIC T4 Ga (-60 °C ≤ T_a ≤ +70 °C)

Table B-17. Input Parameters

Parameter	HART	Fieldbus/PROFIBUS
Voltage U _i	30 V	30 V
Current I _i	200 mA	300 mA
Power P _i	1.0 W	1.3 W
Capacitance C _i	0.012 μF	0 μF
Inductance L _i	0 mH	0 mH

Special Condition for Safe Use (X):

1. If the equipment is fitted with an optional 90 V transient suppressor, it is incapable of withstanding the 500 V isolation from earth test and this must be taken into account during installation.
2. The enclosure may be made of aluminum alloy and given a protective polyurethane paint finish; however care should be taken to protect it from impact and abrasion when located in Zone 0.

IG IECEx FISCO

Certificate: IECExBAS08.0045X
 Standards: IEC60079-0:2011, IEC60079-11:2011
 Markings: Ex ia IIC T4 Ga (-60 °C ≤ T_a ≤ +60 °C)

Table B-18. Input Parameters

Parameter	FISCO
Voltage U _i	17.5 V
Current I _i	380 mA
Power P _i	5.32 W
Capacitance C _i	0 μF
Inductance L _i	0 mH

Special Condition for Safe Use (X):

1. If the equipment is fitted with an optional 90 V transient suppressor, it is incapable of withstanding the 500 V isolation from earth test and this must be taken into account during installation.
2. The enclosure may be made of aluminum alloy and given a protective polyurethane paint finish; however care should be taken to protect it from impact and abrasion when located in Zone 0.

N7 IECEx Type n

Certificate: IECExBAS08.0046X
Standards: IEC60079-0:2011, IEC60079-15:2010
Markings: Ex nA IIC T4 Gc ($-40\text{ °C} \leq T_a \leq +70\text{ °C}$)

Special Condition for Safe Use (X):

1. If fitted with a 90 V transient suppressor, the equipment is not capable of withstanding the 500 V electrical strength test as defined in clause 6.5.1 of IEC60079-15:2010. This must be taken into account during installation.

B.4.6 Brazil

E2 INMETRO Flameproof

Certificate: UL-BR 14.0375X
Standards: ABNT NBR IEC60079-0:2008 + Errata 1:2011, ABNT NBR IEC 60079-1:2009 + Errata 1:2011, ABNT NBR IEC 60079-26:2008 + Errata 1:2009
Markings: Ex db IIC T6...T4 Ga/Gb IP66, T6 ($-60\text{ °C} \leq T_a \leq +70\text{ °C}$), T4/T5 ($-60\text{ °C} \leq T_a \leq +80\text{ °C}$)

Special Condition for Safe Use (X):

1. The device contains a thin wall diaphragm less than 1 mm thickness that forms a boundary between zone 0 (process connection) and zone 1 (all other parts of the equipment). The model code and datasheet are to be consulted for details of the diaphragm material. Installation, maintenance and use shall take into account the environmental conditions to which the diaphragm will be subjected. The manufacturer's instructions for maintenance shall be followed in detail to assure safety during its expected lifetime.
2. Flameproof joints are not intended for repair.
3. Non-standard paint options may cause risk from electrostatic discharge. Avoid installations that could cause electrostatic build-up on painted surfaces, and only clean the painted surfaces with a damp cloth. If paint is ordered through a special option code, contact the manufacturer for more information.

I2 INMETRO Intrinsic Safety

Certificate: UL-BR 14.0759X
Standards: ABNT NBR IEC 60079-0:2008 + Errata 1:2011; ABNT NBR IEC 60079-11:2009
Markings: Ex ia IIC T4 Ga ($-60\text{ °C} \leq T_a \leq +70\text{ °C}$)

Table B-19. Input Parameters

Parameter	HART	Fieldbus/PROFIBUS
Voltage U_i	30 V	30 V
Current I_i	200 mA	300 mA
Power P_i	1 W	1.3 W
Capacitance C_i	0.012 μ F	0 μ F
Inductance L_i	0 mH	0 mH

Special Conditions for Safe Use (X):

1. If the equipment is fitted with an optional 90 V transient suppressor, it is incapable of withstanding the 500 V insulation from earth test and this must be taken into account during installation.
2. The enclosure may be made of aluminium alloy and given a protective polyurethane paint finish; however care should be taken to protect it from impact and abrasion when located in atmospheres that require ELP Ga.

IB INMETRO FISCO

Certificate: UL-BR 14.0759X
Standards: ABNT NBR IEC 60079-0:2008 + Errata 1:2011; ABNT NBR IEC 60079-11:2009
Markings: Ex ia IIC T4 Ga ($-60\text{ °C} \leq T_a \leq +60\text{ °C}$)

Table B-20. Input Parameters

Parameter	FISCO
Voltage U_i	17.5 V
Current I_i	380 mA
Power P_i	5.32 W
Capacitance C_i	0 μ F
Inductance L_i	0 mH

Special Condition for Safe Use (X):

1. If the equipment is fitted with an optional 90 V transient suppressor, it is incapable of withstanding the 500 V insulation from earth test and this must be taken into account during installation.
2. The enclosure may be made of aluminium alloy and given a protective polyurethane paint finish; however care should be taken to protect it from impact and abrasion when located in atmospheres that require ELP Ga.

B.4.7 China

E3 China Flameproof

Certificate: GYJ13.1386X; GYJ5.1366X [Flowmeters]

Standards: GB3836.1-2010, GB3836.2-2010, GB3836.20-2010-2010

Markings: Pressure Transmitter: Ex d IIC Gb,
 T6(-50 °C ≤ T_a ≤ +65 °C),
 T5(-50 °C ≤ T_a ≤ +80 °C)
 Flowmeter: Ex d IIC Ga/Gb,
 T6(-50 °C ≤ T_a ≤ +65 °C),
 T5(-50 °C ≤ T_a ≤ +80 °C)

Special Conditions for Safe Use (X):

- Symbol “X” is used to denote specific conditions of use:
 - The Ex d blanking elements, cable glands, and wiring shall be suitable for a temperature of 90 °C.
 - This device contains a thin wall diaphragm. Installation, maintenance and use shall take into account the environment conditions to which the diaphragm will be subjected.
- The relation between T code and ambient temperature range is:

T _a	Temperature class
-50 °C ≤ T _a ≤ +80 °C	T5
-50 °C ≤ T _a ≤ +65 °C	T6
- The earth connection facility in the enclosure should be connected reliably.
- During installation, use and maintenance of the product, observe the warning “Don’t open the cover when the circuit is alive.”
- During installation, there should be no mixture harmful to flameproof housing.
- Cable entry and conduit, certified by NEPSI with type of protection Ex d IIC and appropriate thread form, should be applied when installed in a hazardous location. Blanking elements should be used on the redundant cable entries.
- End users are not permitted to change any internal components, but to settle the problem in conjunction with the manufacturer to avoid damage to the product.
- Maintenance should be done in a non-hazardous location.
- During installation, use and maintenance of this product, observe the following standards: GB3836.13-2013, GB3836.15-2000, GB3836.16-2006, GB50257-2014.

I3 China Intrinsic Safety

Certificate: GYJ12.1295X;

GYJ15.1365X [Flowmeters]

Standards: GB3836.1-2010, GB3836.4-2010, GB3836.20-2010

Markings: Ex ia IIC T4 Ga (-60 °C ≤ T_a ≤ +70 °C)

Special Conditions for Safe Use (X):

- Symbol “X” is used to denote specific conditions of use:
 - If the apparatus is fitted with an optional 90 V transient suppressor, it is not capable of withstanding the 500 V insulation test for 1 minute. This must be taken into account when installing the apparatus.
 - The enclosure may be made of aluminum alloy and given a protective polyurethane paint finish; however, care should be taken to protect it from impact or abrasion if located in Zone 0.
- The relation between T code and ambient temperature range is:

Model	T code	Temperature range
HART, Fieldbus, PROFIBUS, and Low Power	T4	-60 °C ≤ T _a ≤ +70 °C

- Intrinsically safe parameters:

Parameter	HART	Fieldbus/ PROFIBUS	FISCO
Voltage U _i	30 V	30 V	17.5 V
Current I _i	200 mA	300 mA	380 mA
Power P _i	1 W	1.3 W	5.32 W
Capacitance C _i	0.012 μF	0 μF	0 nF
Inductance L _i	0 mH	0 mH	0 μF

Note

FISCO parameters comply with the requirements for FISCO field devices in GB3836.19-2010.

[For Flowmeters] When Rosemount 644 Temperature Transmitter is used, the transmitter should be used with Ex-certified associated apparatus to establish explosion protection system that can be used in explosive gas atmospheres. Wiring and terminals should comply with the instruction manual of both Rosemount 644 and associated apparatus. The cables between Rosemount 644 and associated apparatus should be shielded cables (the cables must have insulated shield). The shielded cable has to be grounded reliably in a non-hazardous area.

4. The product should be used with Ex-certified associated apparatus to establish explosion protection system that can be used in explosive gas atmospheres. Wiring and terminals should comply with the instruction manual of the product and associated apparatus.
5. The cables between this product and associated apparatus should be shielded cables (the cables must have insulated shield). The shielded cable has to be grounded reliably in a non-hazardous area.
6. End users are not permitted to change any internal components, and needs to settle the problem in conjunction with the manufacturer to avoid damage to the product.
7. During installation, use and maintenance of this product, observe the following standards: GB3836.13-2013, GB3836.15-2000, GB3836.16-2006, GB3836.18-2010, GB50257-2014.

B.4.8 Japan

- E4** Japan Flameproof
Certificate: TC20598, TC20599, TC20602, TC20603 [HART]; TC20600, TC20601, TC20604, TC20605 [Fieldbus]
Markings: Ex d IIC T5

B.4.9 Technical Regulations Customs Union (EAC)

- EM** EAC Flameproof
Certificate: RU C-US.GB05.B.01199
Markings: Ga/Gb Ex d IIC T5/T6 X,
T5(-50 °C ≤ T_a ≤ +80 °C),
T6(-50 °C ≤ T_a ≤ +65 °C)

Special Condition for Safe Use (X):

1. See certificate for special conditions.

- IM** EAC Intrinsically Safe
Certificate: RU C-US.GB05.B.01199
Markings: 0Ex ia IIC T4 Ga X (-60 °C ≤ T_a ≤ +70 °C)

Special Condition for Safe Use (X):

1. See certificate for special conditions.

B.4.10 Combinations

- K1** Combination of E1, I1, N1, and ND
K2 Combination of E2 and I2
K5 Combination of E5 and I5
K6 Combination of E6 and I6

- K7** Combination of E7, I7, N7 and IECEx Dust
IECEx Type n
Certificate: IECExBAS08.0058X
Standards: IEC60079-0:2011, IEC60079-15:2010
Markings: Ex nA IIC T95 °C T₅₀₀ 105 °C Da
(-20 °C ≤ T_a ≤ +85 °C)

Special Condition for Safe Use (X):

1. If the equipment is fitted with an optional 90 V transient suppressor, it is incapable of withstanding a 500 V isolation from earth test and this must be taken into account during installation.

- KA** Combination of E1, I1, and K6
KB Combination of K5 and K6
KC Combination of E1, I1, and K5
KD Combination of K1, K5, and K6
KM Combination of EM and IM

B.4.11 Additional Certifications

- SBS** American Bureau of Shipping (ABS) Type Approval
Certificate: 09-HS446883B-3-PDA
Intended Use: Marine and Offshore Applications
Measurement of either Gauge or Absolute Pressure for Liquid, Gas, and Vapor
ABS Rules: 2013 Steel Vessels Rules 1-1-4/7.7, 1-1-Appendix 3, 4-8-3/1.7, 4-8-3/13.1

- SBV** Bureau Veritas (BV) Type Approval
Certificate: 23157/B0 BV
BV Rules: Bureau Veritas Rules for the Classification of Steel Ships
Application: Class notations: AUT-UMS, AUT-CCS, AUT-PORT and AUT-IMS; Pressure transmitter type 2051 cannot be installed on diesel engines.

- SDN** Det Norske Veritas (DNV) Type Approval
Certificate: TAA00004F
Intended Use: DNV GL Rules for Classification — Ships and offshore units
Application:

Locations classes	
Type	2051
Temperature	D
Humidity	B
Vibration	A
EMC	B
Enclosure	D

SLL Lloyds Register (LR) Type Approval
Certificate: 11/60002
Application: Environmental categories ENV1, ENV2,
ENV3, and ENV5

B.5 Rosemount 3051 Wireless

Rev 1.3

B.5.1 European Directive Information

A copy of the EC Declaration of Conformity can be found at the end of the Quick Start Guide. The most recent revision of the EC Declaration of Conformity can be found at Emerson.com/Rosemount.

B.5.2 Telecommunication compliance

All wireless devices require certification to ensure that they adhere to regulations regarding the use of the RF spectrum. Nearly every country requires this type of product certification. Emerson is working with governmental agencies around the world to supply fully compliant products and remove the risk of violating country directives or laws governing wireless device usage.

B.5.3 FCC and IC

This device complies with Part 15 of the FCC Rules. Operation is subject to the following conditions: This device may not cause harmful interference. This device must accept any interference received, including interference that may cause undesired operation. This device must be installed to ensure a minimum antenna separation distance of 20 cm from all persons.

B.5.4 Ordinary Location Certification from FM Approvals

As standard, the transmitter has been examined and tested to determine that the design meets the basic electrical, mechanical, and fire protection requirements by a nationally recognized test laboratory (NRTL) as accredited by the Federal Occupational Safety and Health Administration (OSHA).

B.5.5 Installing in North America

The US National Electrical Code (NEC) and the Canadian Electrical Code (CEC) permit the use of Division marked equipment in Zones and Zone marked equipment in Divisions. The markings must be suitable for the area classification, gas, and temperature class. This information is clearly defined in the respective codes.

B.5.6 USA

- I5** U.S.A. Intrinsically Safe (IS)
Certificate: FM 3046325
Standards: FM Class 3600 – 2011,
FM Class 3610 – 2010,
FM Class 3810 – 2005,
ANSI/ISA 60079-0 – 2009,
ANSI/ISA 60079-11 – 2009,
NEMA 250 – 2003, ANSI/IEC 60529
Markings: IS CL I, DIV 1, GP A, B, C, D T4;
CL 1, Zone 0 AEx ia IIC T4;
T4(–40 °C ≤ T_a ≤ +70 °C) when installed per
Rosemount drawing 03031-1062;
Type 4X/IP66/IP68

Special Conditions for Safe Use (X):

1. The Rosemount 3051 Wireless Pressure Transmitter shall only be used with the 701PGNKF Rosemount SmartPower Battery Pack.
2. The in-line pressure sensor may contain more than 10 percent aluminum and is considered a potential risk of ignition by impact or friction. Care must be taken into account during installation and used to prevent impact and friction.
3. The surface resistivity of the transmitter housing is greater than one gigaohm. To avoid electrostatic charge build-up, it must not be rubbed or cleaned with solvents or a dry cloth.

B.5.7 Canada

- I6** Canada Intrinsically Safe
Certificate: CSA2526009
Standards: CAN/CSA C22.2 No. 0-M91,
CAN/CSA C22.2 No. 94-M91,
CSA Std C22.2 No. 142-M1987,
CSA Std C22.2 No. 157-92,
CSA Std C22.2 No. 60529:05
Markings: Intrinsically Safe for Class I, Division 1,
Groups A, B, C, D, T4 when installed per
Rosemount drawing 03031-1063; Type
4X/IP66/IP68

B.5.8 Europe

- I1** ATEX Intrinsic Safety
 Certificate: Baseefa12ATEX0228X
 Standards: EN 60079-0:2012, EN 60079-11:2012
 Markings: ⓂII 1 G Ex ia IIC T4 Ga,
 T4(-40 °C ≤ T_a ≤ +70 °C) IP66/IP68

Special Conditions for Safe Use (X):

1. The plastic enclosure may constitute a potential electrostatic ignition risk and must not be rubbed or cleaned with a dry cloth.
2. The Rosemount 701PGNKF Power Module may be replaced in a hazardous area. The power module has a surface resistivity greater than 1 GΩ and must be properly installed in the wireless device enclosure. Care must be taken during transportation to and from the point of installation to prevent electrostatic charge build-up.

B.5.9 International

- I7** IECEx Intrinsic Safety
 Certificate: IECEx BAS 12.0124X
 Standards: IEC 60079-0:2011, IEC 60079-11:2011
 Markings: Ex ia IIC T4 Ga,
 T4(-40 °C ≤ T_a ≤ +70 °C) IP66/IP68

Special Conditions for Safe Use (X)

1. The plastic enclosure may constitute a potential electrostatic ignition risk and must not be rubbed or cleaned with a dry cloth.
2. The Rosemount 701PGNKF Power Module may be replaced in a hazardous area. The power module has a surface resistivity greater than 1 GΩ and must be properly installed in the wireless device enclosure. Care must be taken during transportation to and from the point of installation to prevent electrostatic charge build-up.

B.5.10 Brazil

- I2** INMETRO Intrinsic Safety
 Certificate: UL-BR 13.0534X
 Standards: ABNT NBR IEC 60079-0:2008 + Errata
 1:2011, ABNT NBR IEC 60079-11:2009
 Markings: Ex ia IIC T4 IP66 Ga,
 T4(-40 °C ≤ T_a ≤ +70 °C)

Special Condition for Safe Use (X):

1. See certificate for special conditions.

B.5.11 China

- I3** China Intrinsic Safety
 Certificate: GYJ13.1362X
 GYJ15.1367X [Flowmeters]
 Standards: GB3836.1-2010, GB3836.4-2010,
 GB3836.20-2010
 Markings: Ex ia IIC T4 Ga, T4(-40 ~ +70 °C)

Special Condition for Safe Use (X):

1. See certificate for special conditions.

B.5.12 Japan

- I4** TIIS Intrinsic Safety
 Certificate: TC22022X (3051C/L) TC22023X (3051T)
 TC22024X (3051CFx)
 Markings: Ex ia IIC T4 Ga, T4(-20 ~ +60 °C)

Special Condition for Safe Use (X):

1. See certificate for special conditions.

B.5.13 EAC - Belarus, Kazakhstan, Russia

- IM** Technical Regulation Customs Union (EAC) Intrinsic Safety
 Certificate: RU C-US.ГБ05.B.00400
 Markings: 0Ex ia IIC T4 Ga X;

Special Condition for Safe Use (X):

1. See certificate for special conditions.

B.5.14 Korea

- IP** Korea Intrinsic Safety
 Certificate: 13-KB4BO-0295X
 Markings: Ex ia IIC T4 (-40 °C ≤ T_a ≤ +70 °C)

Special Condition for Safe Use (X):

1. See certificate for special conditions.

B.6 Rosemount 2051 Wireless

Rev 1.2

B.6.1 European Directive Information

A copy of the EU Declaration of Conformity can be found at the end of the Quick Start Guide. The most recent revision of the EU Declaration of Conformity can be found at Emerson.com/Rosemount.

B.6.2 Telecommunication compliance

All wireless devices require certification to ensure that they adhere to regulations regarding the use of the RF spectrum. Nearly every country requires this type of product certification. Emerson is working with governmental agencies around the world to supply fully compliant products and remove the risk of violating country directives or laws governing wireless device usage.

B.6.3 FCC and IC

This device complies with Part 15 of the FCC Rules. Operation is subject to the following conditions: This device may not cause harmful interference. This device must accept any interference received, including interference that may cause undesired operation. This device must be installed to ensure a minimum antenna separation distance of 20 cm from all persons.

B.6.4 Ordinary Location Certification

As standard, the transmitter has been examined and tested to determine that the design meets the basic electrical, mechanical, and fire protection requirements by a nationally recognized test laboratory (NRTL) as accredited by the Federal Occupational Safety and Health Administration (OSHA).

B.6.5 Installing in North America

The US National Electrical Code (NEC) and the Canadian Electrical Code (CEC) permit the use of Division marked equipment in Zones and Zone marked equipment in Divisions. The markings must be suitable for the area classification, gas, and temperature class. This information is clearly defined in the respective codes.

B.6.6 USA

- I5** U.S.A. Intrinsically Safe (IS)
Certificate: FM 3046325
Standards: FM Class 3600 – 2011,
FM Class 3610 – 2010,
FM Class 3810 – 2005,
ANSI/ISA 60079-0 – 2009,
ANSI/ISA 60079-11 – 2009,
NEMA 250 – 2003, ANSI/IEC 60529
Markings: IS CL I, DIV 1, GP A, B, C, D T4;
CL 1, Zone 0 AEx ia IIC T4;
T4(–40 °C ≤ T_a ≤ +70 °C) when installed per
Rosemount drawing 03031-1062;
Type 4X/IP66/IP68


Special Conditions for Safe Use (X):

1. The Rosemount 2051 Wireless Pressure Transmitter shall only be used with the 701PGNKF Rosemount SmartPower Battery Pack.
2. The in-line pressure sensor may contain more than 10 percent aluminum and is considered a potential risk of ignition by impact or friction. Care must be taken into account during installation and used to prevent impact and friction.
3. The surface resistivity of the transmitter housing is greater than one gigaohm. To avoid electrostatic charge build-up, it must not be rubbed or cleaned with solvents or a dry cloth.

B.6.7 Canada

- I6** Canada Intrinsically Safe
Certificate: CSA 2526009
Standards: CAN/CSA C22.2 No. 0-M91,
CAN/CSA C22.2 No. 94-M91,
CSA Std C22.2 No. 142-M1987,
CSA Std C22.2 No. 157-92,
CSA Std C22.2 No. 60529:05
Markings: Intrinsically Safe for Class I, Division 1,
Groups A, B, C, D, T4 when installed per
Rosemount drawing 03031-1063;
Type 4X/IP66/IP68

B.6.8 Europe

- I1** ATEX Intrinsic Safety
 Certificate: Baseefa12ATEX0228X
 Standards: EN 60079-0:2012, EN 60079-11:2012
 Markings:  II 1 G Ex ia IIC T4 Ga,
 T4(-40 °C ≤ T_a ≤ +70 °C) IP66/IP68

Special Conditions for Safe Use (X):

1. The plastic enclosure may constitute a potential electrostatic ignition risk and must not be rubbed or cleaned with a dry cloth.
2. The Rosemount 701PGNKF Power Module may be replaced in a hazardous area. The power module has a surface resistivity greater than 1 GΩ and must be properly installed in the wireless device enclosure. Care must be taken during transportation to and from the point of installation to prevent electrostatic charge build-up.

B.6.9 International

- I7** IECEx Intrinsic Safety
 Certificate: IECEx BAS 12.0124X
 Standards: IEC 60079-0:2011, IEC 60079-11:2011
 Markings: Ex ia IIC T4 Ga, T4(-40 °C ≤ T_a ≤ +70 °C)
 IP66/IP68

Special Conditions for Safe Use (X):

1. The plastic enclosure may constitute a potential electrostatic ignition risk and must not be rubbed or cleaned with a dry cloth.
2. The Rosemount 701PGNKF Power Module may be replaced in a hazardous area. The power module has a surface resistivity greater than 1 GΩ and must be properly installed in the wireless device enclosure. Care must be taken during transportation to and from the point of installation to prevent electrostatic charge build-up.

B.6.10 Brazil

- I2** INMETRO Intrinsic Safety
 Certificate: UL-BR 13.0534X
 Standards: ABNT NBR IEC 60079-0:2008 + Errata
 1:2011, ABNT NBR IEC 60079-11:2009
 Markings: Ex ia IIC T4 IP66 Ga,
 T4(-40 °C ≤ T_a ≤ +70 °C)

Special Condition for Safe Use (X):

1. See certificate for special conditions.

B.6.11 China

- I3** China Intrinsic Safety
 Certificate: GYJ12.1295X
 GYJ15.1365X [Flowmeters]
 Standards: GB3836.1-2010, GB3836.4-2010,
 GB3836.20-2010
 Markings: Ex ia IIC Ga T4, -40 ~ +70 °C

Special Condition for Safe Use (X):

1. See certificate for special conditions.

B.6.12 Japan

- I4** TIIS Intrinsic Safety
 Certificate: TC22022X (2051C/L) TC22023X (2051T)
 TC22024X (2051CFx)
 Markings: Ex ia IIC T4 Ga, T4(-20 ~ +60 °C)

Special Condition for Safe Use (X):

1. See certificate for special conditions.

B.6.13 EAC - Belarus, Kazakhstan, Russia

- IM** Technical Regulation Customs Union (EAC) Intrinsic Safety
 Certificate: RU C-US.ГБ05.B.00390
 Markings: 0Ex ia IIC T4 Ga X;

Special Condition for Safe Use (X):

1. See certificate for special conditions.

B.6.14 Korea

- IP** Korea Intrinsic Safety
 Certificate: 13-KB4BO-0295X
 Markings: Ex ia IIC T4 (-40 °C ≤ T_a ≤ +70 °C)

Special Condition for Safe Use (X):

1. See certificate for special conditions.

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